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Electrically Operated Dredge Owned and Operated by City of Oakland, Cal.

Features of Electrically Operated Hydraulic Dredge

Description of Dredge Owned and Operated by City of Oakland, Cal.—Advantages of Electric Drive and Savings Effected — Central-Station Service Is Used

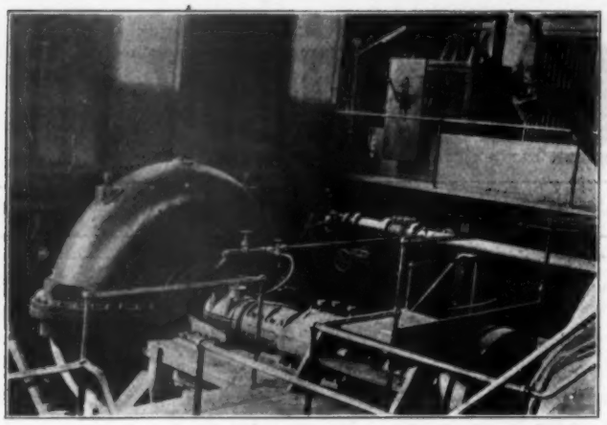
By CHARLES. W. GEIGER

ALTHOUGH not an entirely new field for electrical engineering or the application of electric apparatus, there are only a very few motor-operated hydraulic suction dredges in existence at the present time. For this reason a description of the 20-in. dredge, owned and operated by the City of Oakland, Cal., and the successful results obtained are worthy of mention and consideration by the electrical industry.

The operation of a hydraulic suction dredge is a simple process whereby solid material, heavier than water, such as sand and gravel, is raised and transported from its place through pipes by virtue of the velocity of a current of water in the pipes. The dredge itself is similar to a houseboat in appearance and floats on the water. For this reason it is essential that the dredging machinery be as light and compact as possible while from the nature of the work it must be very powerful, rugged and able to withstand heavy overloads and severe usage.

The electric motor affords a compact, easily controlled and highly efficient substitute for steam drive in such work. In addition it permits the use of an exterior source of power which effects a great reduction in the weight of the dredge. Central-station service is of course especially valuable for such work due to the fact that it is often carried on over a large area and on account of the nature of the load. Moreover, such service is much cheaper in the majority of cases. In this particular case a saving of approximately 50% has been effected in several instances and naturally the city officials of Oakland recommend such service and the electrically operated dredge very highly.

The equipment of a hydraulic suction dredge consists of a centrifugal suction pump, the spuds, the



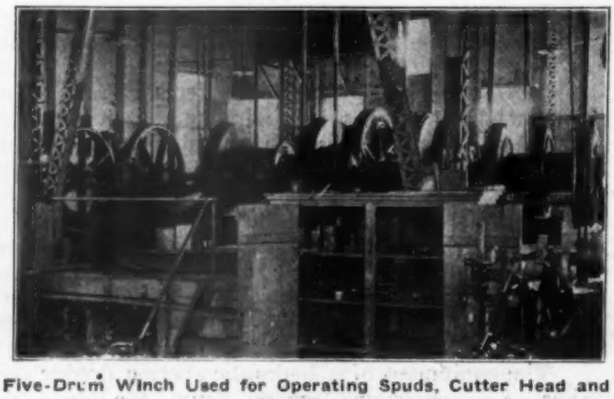
Interior of Oakland Dredge, Showing Pumps and Power Transformers.

cutter and several auxiliaries. On this dredge all this apparatus is operated by electric motors.

The cutting machinery is driven by a 150-hp. variable-speed motor. The motor is operated at 600 r.p.m. and is located in the hold of the dredge forward, on the fore and aft center line, and connected with the cutter by double reduction gearing and a universal coupling. The cutter shaft is operated at 15 r.p.m. and the normal position in operation is at an angle of 45°. The control consists of a reversible drum controller with suitable starting resistance.

For raising and lowering the spuds, cutter head and head lines, a five drum winch is used, belt connected to a 600 r.p.m. variable-speed motor, controlled by a reversible drum controller with a rheostat of sufficient resistance to permit of a 75% speed reduction.

The spuds, which are two heavily weighted iron-shod timbers 65 ft. in length, are at the stern of the dredge and are supported by a steel gallows 60 ft. in height. They serve to brace the dredge as the cutter moves forward into the bed of the stream and can be raised or lowered alternately by a controlling winch, which permits the dredge to swing in an arc. The cutter can be used to open up a channel about 180 ft. in width and cut away the bed of the stream to a depth of 30 to 40 ft. The main suction pipe, which extends along a steel ladder at end of which is the cutter, catches and conveys the dirt and water directly behind the cutter, drawing both off as it is cut away. The suction pump is of the centrifugal type, with a single runner 20-in. suction and discharge operating at 360 r.p.m. It is located athwartships and connected directly by a leather link coupling to a 750-hp., 3-phase, 60-cycle, 2-speed induction motor. Although rated at 750 hp., this motor is able to withstand heavy overloads and often operates at 900 hp. without trouble. The control apparatus consists of a drum controller and an iron-grid heavy-duty starting rheostat, which handles the secondary current of the motor only, the primary current being controlled by means of an automatic oil switch.



Five-Drum Winch Used for Operating Spuds, Cutter Head and Headlines.

The water and silt from the cutter are carried back over the stern of the dredge through a 20-in. pipe line connection at the rate of 3500 cu. yd. per 24 hrs. With 15% solid material, a velocity of 12 ft. per sec. is obtainable but will vary somewhat according to the class of material handled.

The long continuous discharge pipe is made up of sections 40 ft. in length carried on pontoons and connected by flexible rubber couplings, which serve to carry the material suspended in the water to the desired point of deposit. This pipe line extends to the shore line, and in one particular case had to be submerged in the estuary, so as not to block navigation, and continued to the tide lands of Alameda which were being filled in.

In addition to the above there is one 20-hp., 2200-volt, constant-speed motor belted to a rotary air pump for priming the main suction pump and a 6-in. single-stage centrifugal general service pump.

Cutter Head of Oakland Dredge.

The switchboard consists of one main service panel and three feeder panels. The starting compensators for the constant-speed motors are placed in the stern of the dredge. Power is supplied by the Pacific Gas & Electric Co. over a short transmission line from its station A, in the immediate vicinity at a tension of 11,000 volts stepped down to 2300 volts by means of three 250-kv-a. transformers located on board the stern end of the dredge above the main deck. In addition, a 10-kw. transformer is provided to furnish a 110-volt supply for the lighting of the dredge and the floodlights. Shore connections are made by a 1200-ft., 3-conductor flexible armored cable which permits of considerable range of operation without shifting. The cable is carried on a special reel on a houseboat in the rear of the dredger and is run from the shore to the houseboat on poles placed 200 ft. apart.

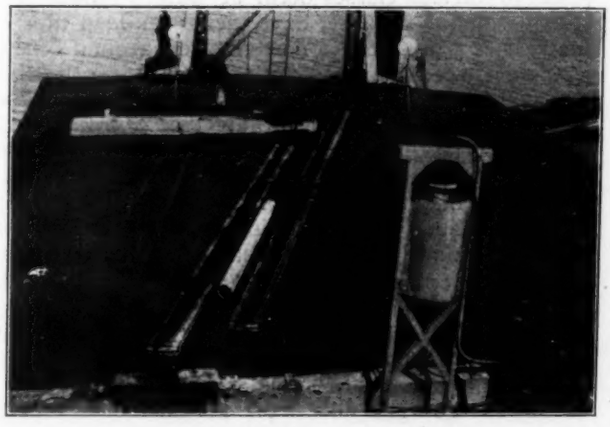
Due to the fact that the dredge is usually operated about 20 hrs. a day, special attention has been given

to the lighting. The interior of the dredge is adequately lighted with 100 and 150-watt units and in addition several floodlights have been installed on the decks to illuminate the surrounding water surface and the shore. Several of these floodlights are of special construction and all are portable.

Saving Made in Filling in Oakland Auditorium Site.

An illustration of some of this particular dredge's work was the discharge of material through 7500 ft. of pipe line to fill the site where the Oakland Civic Auditorium now stands and which was once a marsh. The average cost of operation of the dredge at the time of making this fill was about $5500 per month. This cost was made up of the following items; labor, $3000, power $2000, incidentals $50. The dredge was operated on an average of 20 hrs. per day and 20 days per month. The work was done at a cost of about 5 cents per cu. yd. The competitive bids made by outside dredging companies, all of whom used steam power, ran from 10½ to 12 cents per cu. yd.

The cost of operating the electric dredge at the present time under average conditions for a long period is about $10,000 per month. This includes



Flood Lights on Oakland Dredge. Light in Foreground is of Special Design.

$950 per month for the motor-boat tender, pipe worn out, and repairs to the equipment. At the present time the dredge averages 20 hrs. of operation every day the year around. The cost per unit fluctuates from 5 cents in mud to 12 cents per cu. yd. for hard pan. According to the Oakland harbor engineer, this dredger is doing work under unfavorable conditions at half the cost of the steam dredgers operated by private contractors. Under the same conditions these contractors would charge from 18 to 24 cents for the work which the city dredger is now doing.

The crew consists of the chief engineer, leverman and eight men on board. Two or three additional men attend to the extending of the pipe on land. This also represents a saving over the number of men required to operate a steam dredge.

ITALY TO ESTABLISH INDUSTRIAL LABORATORIES.

Experiment Stations and Laboratory Schools for Various Industries, Including Electrotechnical, to Be Established.

Appreciating the importance of applying scientific methods in its industrial development, if it is to solve successfully the great problems of reconstruction and to meet competition from other nations whose industries are more highly organized, Italy has decided to devote special attention to the question of industrial experiment stations and of technical education. The necessity for such action is made more urgent by the adoption, in many industries, of an 8-hour day. If the working day is shortened to 8 hours, increased efficiency in manufacturing methods must be brought about if production is to be maintained.

In this connection the Italian Government, together with the manufacturers, is preparing to establish experiment stations for the principal lines of industry. In addition to studying new processes and making new applications of old methods, these stations will supply the industries with a trained personnel. Preparatory meetings at which the manufacturers were represented have recently been held at the office of the Undersecretary of Labor.

Up to the present there have been only four such stations—two at Milan, for paper and fats, respectively, and two at Naples, for leather and ceramics. Another is being added to Reggio Calabria for essential oils and perfumes. At the recent conferences it was decided to establish the following new stations: At Rovigno, for the sugar industry, in connection with the existing school of beet culture; at Milan, for the development of the refrigerating industry: a third, probably at Rome to study the distillation of gases and their byproducts and, in general, all the processes of combustion. One section of this last-named station will devote itself to the question of the utilization of national fuels and lignite, which, it is said, is suitable for the production of gas. Later on consideration will be given to the creation of stations, on the initiative of the manufacturers, for the electrotechnical and phototechnical industries and for dyestuffs.

By a decree of December, 1918, provision was made for the establishment of laboratory schools in order that the standard of vocational education might be raised. At first there will be 20 of these schools, of which two will be at Milan, one for mechanics and the other for carpenters. In addition to a Government subsidy of 25,000 lire ($4825 at normal exchange) each, the laboratory schools will receive appropriations from the local authorities and the obligatory support of the manufacturers. In accordance with an agreement recently reached by the Undersecretaries of Labor and of Arms and Munitions there will be assigned to these schools war material amounting to about 25,000,000 lire ($4,825,000). The schools established by the Ministry of War during the war at Turin, Milan, Genoa, Modena, Florence, Rome, Naples, and Palermo will be transformed into laboratory schools. Provision will also be made for the ordinary industrial schools, 150 of which are royal schools and 400 of which are subsidized. In all these schools short courses of study, both practical and theoretical, will be instituted.

ELECTRIC POWER USED IN BURMAH OIL FIELDS.

Drilling and pumping wells by electric power has been introduced by the Burmah Oil Co. in its operations in the Yenangyoung field in Burmah. Considerable saving in the cost of getting the petroleum to the refineries is one of the chief advantages of the plan, as reported by John T. Cargill, chairman of the board of the company.

Central-Station Rates in Theory and Practice

Sixth Article—How Diversity of Demand Affects the Demand Cost — Diversity-Factor Defined — Other Features Affecting Demand Cost — Mean and Weighted Averages

By H. E. EISENMENGER

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This is the sixth article of this series, which will continue to appear weekly throughout practically the entire current volume. A general outline of the entire series will be found in the issue of July 5, 1919. In the early articles of the series, the first of which appeared July 12, costs of service were discussed in general and with special reference to electric service. It was shown that analysis of the costs of rendering this service is necessary before rates for the service can be set or even intelligently discussed. The present article concludes the consideration of the second element of cost—demand cost—and the next one will take up the third element—consumer cost.

PART I—THE COST OF ELECTRIC SERVICE—Continued.

II-A. The Three Elements of Cost.

B. Apportionment of the Demand Cost between the Customers.

5. The Diversity-Factor.

SECTION 42. If the load curves of all customers would have the same shape amongst each other, the central station would have to have a load curve of the same shape (disregarding losses and home consumption of the central station) and the peak load of each customer would occur at the time of the central station's peak load. Then the sum of the customers' peak loads would be equal to the central station's peak load and the error introduced by replacing the peak responsibility with the consumer's maximum demand would be nil.

Actually, however, the shapes of the various consumers' load curves are different from one another. We can now classify the consumers into various groups or classes in such a manner that the curves within each class are liable to have similar shapes. For instance, we might group the lighting customers in one class and the power customers in another one. Lighting consumers will draw almost all their current during the evening, whereas most power consumers will consume practically all their current during the regular working hours, that is, mostly in daytime during week days. Then we may subdivide each one of these classes. For instance, the lighting consumers might be subdivided into stores, offices, factories, restaurants, theaters, churches, residences, street lighting and others. If necessary the subdivision may be carried further, for instance, the stores may be subdivided according to what is sold therein, etc. Various central stations have different practices in this respect. Likewise, the power consumers may be divided into a number of classes.

The error will then not be so very great that is introduced by the assumption that all the customers of the same class have the same shape of load curve. Gross deviations from the average load curve will occur only in individual cases and need not be given individual attention. In fact, they cannot be given individual attention.

It is not difficult to picture to ourself how the peaks of various classes occur at various times. The stores will, for instance, have their peak-load time of the year at 5 p. m. or soon afterwards, around Christmas time when the days are shortest. Shortly after that hour the rush hours for the street railway will set in when the people are returning from work to their homes. When they arrive at home their residences will be lit up and we have a peak of the residence load which may last until 9 or 10 o'clock. The theaters will have their peaks beginning at about 8 p. m. The peak of summer amusement parks comes, of course, in the summer evenings after sunset. Similar diversities occur between the peaks of the various classes of power load. Where we have an irrigation load for agricultural purposes the peak of that load will even come in the daytime of summer.

43. We might now from actual measurements in a number of representative cases, or by guesswork, obtain the load curve of every class or group of customers and from this we can obtain the ratio of the group's peak responsibility to the group's maximum demand. Then we would have to multiply by that ratio the known cost per kilowatt of peak responsibility to get the cost per kilowatt of that group's maximum demand. This first step would be only another way of basing the demand cost of the class or group on the peak responsibility of the group. Suppose, for instance, the group's load curve shows a peak four times the amount of its peak responsibility, then the cost per kilowatt demand of the group's peak load would be one-fourth of the cost per kilowatt of peak responsibility. If it costs, let us say, $4 of fixed charges per month to keep 1 kilowatt in readiness at the central station, then we must figure only $1 per month as fixed cost per kilowatt of maximum demand of that class of customers. Since the group's maximum demand can, of course, never be smaller than the group's peak responsibility, this correction to the kilowatt cost of the group's maximum demand will never be an increase of unit demand cost, but generally a reduction.

44. This fact, that the peaks of various classes or groups of consumers do not occur at the same time, is called *diversity* of these classes. To make it quite clear what this means we can look at it in another

way. Taking a simple case, let us suppose we have two classes of consumers only, *A* and *B*, each using 1000 kw. throughout the day, but raising their respective demand to 3000 kw. each for one hour during the day. Now, if these two peaks of 3000 kw. coincide, we would need a plant with a capacity of 6000 kw. to satisfy the aggregate demand. If, however, the peaks occur one after the other a plant of 4000 kw. will be large enough; 1000 kw. for one class and 3000 for the other. We can use a portion of the capacity of the plant twice, so to speak, first for *A* and then for *B* (or vice versa) on account of the diversity which exists between the two demands. If we had *A* alone, that class would have to be charged with the demand cost of 3000 kw. as the plant would have to have the capacity of 3000 kw. and the same would apply if we had *B* alone. As it is, with both classes on the lines and with the diversity between them as stated, we have to provide 4000 kw. for the two, and each one will be charged as an average with the demand cost of 2000 kw. only[1], because, as explained above, on account of the diversity we are able to use a part of the capacity of the first plant for one class of consumers and then for the other one.

45. The degree of diversity is measured by the so-called *diversity-factor,* that is, the ratio of the sum of the maximum demands of the various classes divided by the sum of their peak responsibilities; in other words, the diversity-factor is the weighted average[2] of the ratios $\frac{\text{maximum demand}}{\text{peak responsibility}}$ the meaning of which ratios (or, to be exact, of their reciprocate) has been explained in Section 43. As the sum of the peak responsibilities is equal to the peak load, we arrive at the definition of the diversity-factor as being the ratio of the sum of the maximum demands to the peak load[3]. In our example the sum of the maximum demands is $3000 + 3000 = 6000$ kw. and the actual demand (or the sum of the peak responsibilities) is 4000 kw., so that the diversity-factor is $6000/4000 = 1.5$. Obviously the diversity-factor can never be smaller than unity.

The diversity-factor is of great importance in central-station economics. It indicates, so to speak, how many times the capacity of the plant can be used.[4]

46. We have a diversity not only between the various groups or classes of load which in their aggregate build up the central station's load, but also between the consumers of the same class amongst one another. If the consumers of every class would actually have the same load curve, as presupposed so far (Section 42), there would exist no diversity amongst them; in other words, the diversity-factor amongst them would be unity. As a matter of fact, however, there are differences in the load curves and consequently there is a diversity between the consumers of the same class; therefore, the diversity-factor between these consumers will be greater than unity.

An example will make this clear. Measurements have shown[5] in a certain city block of apartments containing 189 residential consumers that the individual maximum demands in these installations, if added up on paper, gave the sum of 68.5 kw. But the actual maximum output of the transformer supplying these 189 installations (and no other load besides them) was only 20 kw. The reason for the difference between these two figures is, of course, that the maxima in the various installations did not occur at the same time. Customer *A* might be entertaining one night in his residence with all his lights ablaze while *B* might that same night happen to use very little light; perhaps he is attending *A*'s party and all the lights in his residence are shut off. *C*'s demand may be a maximum one hour later than *D*'s demand, etc. The diversity-factor in this example would be $68.5/20 = 3.4$. If the demand cost of every kilowatt of transformer's maximum demand would be, for instance, $3.40 per month, there would be a cost of only $1 chargeable to every kilowatt of the consumer's maximum demand. (Of course, owing to the diversity between the various transformers of the system, the cost of the kilowatt of transformer's maximum demand will again be lower than the cost of the kilowatt of central station's peak load. Assuming for illustration that the diversity-factor between the various transformers of that station equals 2, then the demand cost per kilowatt of central station's peak load would be $2 \times \$3.40 = \$6.80$ per month, as against $1 per kilowatt of the maximum demand of the class of consumers in question.)

47. We have so far discussed only two examples of diversity-factor: among the residence consumers to the transformers and among the transformers to the central station. Evidently we can take any group of consumers (or loads) and speak of a diversity-factor among the constituents of that group to the total group. The constituents may again be subdivided into smaller groups. We may, for instance, choose the following successive divisions: Central station, substation, feeder, transformer, consumer, lamp, and then we might distinguish a diversity-factor among the elements of any one of these divisions to any other higher division, as follows:

Among substations to central station

Among feeders to substations;
among feeders to central station.

Among transformers to feeder;
among transformers to substation;
among transformers to central station.

Among consumers to transformer;
among consumers to feeder;
among consumers to substation;
among consumers to central station.

Among lamps to consumer;
among lamps to transformer;
among lamps to feeder;
among lamps to substation;
among lamps to central station.

In every one of these cases[6] we can again distinguish between the *individual* diversity-factor and the *average* diversity-factor. For instance, choosing the diversity-factor among the consumers of the same transformer, we can distinguish a diversity-factor of an individual transformer, or an average diversity-factor of all transformers on the same feeder, or of all transformers on the same substation, etc. (always

[1] Compare also Insert VI.

[2] Readers who are not familiar with the term "weighted average" will find an explanation in Insert VII.

[3] A more complete and general definition of the term "diversity-factor" will be given later (Section 49).

[4] In our above example we have for instance a plant of 4000 kw., whose capacity is distributed in such a manner that
at *A*'s peak-load time: 3000 kw. are used by *A*
+ 1000 kw. by *B* = 4000 kw.;
at *B*'s peak-load time: 1000 kw. are used by *A*
+ 3000 kw. by *B* = 4000 kw.
Assuming from the first one of these two conditions a subdivision of the plant's capacity in such a manner that 3000 kw. are set aside for *A*, and 1000 for *B*, we must conclude that 2000 kw. of *A*'s 3000 can be used over again for *B* at the time of *B*'s peak load and, as these 2000 kw. are one-half of the total plant capacity, this capacity can be used 1½ times. This way of looking at the meaning of the diversity-factor becomes still clearer if we assume more than two (for instance three) customers with the described load curves and the individual peaks occurring one after the other.

[5] Insull, "Central-Station Generation." Transactions A. I. E. E., 1912, page 246.

[6] Except in case of the diversity-factors taken directly to the central station.

meaning the diversity-factor among the consumers to the transformer).

48. Given a certain classification into divisions, for instance as chosen above in Section 47, we can distinguish a diversity-factor among the members of one group either to the next higher group (for instance, consumers to transformers) or to any other group above that (for instance, consumers to feeders or to substations). These latter diversity-factors may be designated as being "combined" from the "elementary" diversity-factors. The combined diversity-factor is the product of the weighted averages[7] of the constituent elementary diversity-factors.

If we take, for instance, the diversity-factor among consumers to a certain feeder as the combined diversity-factor, and choosing the diversity-factor among consumers to transformers, and among transformers to feeder, as the elementary constituents, then we have the following relations:

(a) Individual diversity-factor among the consumers connected to one certain transformer =

$$\frac{\text{sum of maximum demands of all consumers connected to transformer}}{\text{maximum demand of the respective transformer}}$$

(b) Weighted average over the whole feeder of the diversity-factors among the consumers to the transformers = $\frac{\text{sum of the numerators in (a)}}{\text{sum of the denominators in (a)}}$ =

$$\frac{\text{sum of maximum demands of all consumers connected to feeder}}{\text{sum of maximum demands of all transformers connected to feeder.}}$$

(c) Diversity-factor among the transformers connected to one feeder=

$$\frac{\text{sum of maximum demands of all transformers connected to feeder}}{\text{maximum demand of the feeder}}$$

(d) Diversity-factor among the consumers connected to a certain feeder =

$$\frac{\text{sum of maximum demands of all consumers connected to feeder}}{\text{maximum demand of that feeder}}$$

By multiplying the fraction under (b) with that under (c), the denominator of (b) cancels against the numerator of (c) and we get the fraction under (d); this means:

The weighted average over the whole feeder of the diversity-factors among the consumers to the transformers × diversity-factor among the transformers connected to one feeder = diversity-factor among the consumers connected to one certain feeder (combined diversity-factor). This is in accordance with the aforesaid contention.

49. Now we can proceed to the general definition of the term "diversity-factor" as standardized by the American Institute of Electrical Engineers. This definition will now be understood more readily than if we had started the explanation of diversity with that definition. "Diversity-factor is the ratio of the sum of the maximum power demands of the subdivisions of any system or parts of a system to the maximum demand of the whole system or of the part of the system under consideration, measured at the point of supply."[8]

In shorter, though less precise, words we can say that the diversity-factor is the ratio between the sum of the maximum demands and the sum of the peak responsibilities or the average ratio between maximum demand and peak responsibility. It determines, therefore, the ratio by which the demand cost must be reduced from peak responsibility to maximum demand and this is the reason for the importance of the diversity-factor.

Statements about the numerical values of diversity-factors will be found in "Diversity-Factor," by H. B. Gear (Transactions A. I. E. E., 1910, page 375) and in a lecture by Professor Ryan (ELECTRICAL REVIEW, April 3, 1915, page 638).

We can also speak of the diversity-factor between groups of consumers which are not yet connected to the same system of supply. We may, for instance, have a number of neighboring towns, each served from its own central station. If we now scrap these generating systems and connect all those towns to one common station, this latter source of power will not have to be quite as large as the previous independent ones taken together, because the peak loads in the different towns will occur at more or less different times.

6. Variations of the Demand Cost per Kilowatt Maximum Demand Between Consumers.

50. It can be seen from the above that the demand cost, if reduced to the maximum demand of the consumer, varies in a large degree, owing to the diversity of the load curves.

There are other variations in the demand cost per kilowatt between the customers, due to other reasons, for instance the following:

51. The installations of small customers, that is, in general of the residential consumers, are generally scattered more widely apart than the large consumers' installations which are crowded together in the factory and business districts. The small installations require, therefore, a greater length of distribution lines, not only per installation but even more so per kilowatt installed. The transformers are greater in number and smaller in size for a given total capacity. The residences are generally located on the outskirts of the cities, away from the center of gravity of the system of power supply and consequently the transmission lines will have to be both longer and of larger section, etc. All this means greater investment and consequently greater cost of service due to increased interest and other capital charges.

52. Another element which affects the demand cost is the following: Electric light requires a high degree of constancy of voltage since 1% of voltage fluctuation causes more than 3½% fluctuation of the light, so that small fluctuations of the voltage may prove very annoying to the eye. We may easily notice this in some street cars, especially in interurban service, where the voltage regulation is adapted to the modest needs of the motor service only and not with a view to the exacting needs of lighting. Motor service, as just stated, is not as sensitive to fluctuations of the voltage. If it were not for the lighting service our distribution lines in the cities would contain much less copper and they would consequently be much cheaper. We are justified in saying that the capital charges for the extra copper necessary to reduce the necessary fluctuations from the power-service requirements to the narrower limits required by the lighting service should be charged as cost to the lighting consumers only and not to the power consumers.

This and other minor variations in the demand cost between consumers are generally disregarded when it comes to the computation of the cost and of the rates,

[7] Reference is here made again to Insert VII for those readers who are not familiar with the term "weighted average" (see footnote to Section 45).

[8] Transactions A. I. E. E., 1914, page 1797.

but it is well once to get a clear conception that they do exist.

53. In passing, we can return to the kilowatt-hour cost and mention that we have under this heading also variations in the energy cost between customers. (To explain these it has been necessary to first explain what the load curve is and the load-factor and the diversity-factor. Therefore, these variations in the energy cost could not be discussed in their proper place in Section 12 when we were dealing with the energy cost and the other classes of variations of this cost.)

If the load-factor of the customers and their diversity-factor is low, the transformers will run at low load during a large part of the time. Now the efficiency of a transformer decreases if the load on the transformer decreases below full load. Moreover, instantaneous copper losses in the transmission and distribution lines are proportional to the square of the power consumed (at given power-factor[9]); this means that the aggregate losses of energy for a given amount of energy transmitted during a given time are larger if the power is great during a part of the time and small during the rest, than if the energy is transmitted at a uniform rate. In addition to this the power-factor decreases at low transformer loads which increases the average current and therefore further increases the copper losses.

For all these reasons the energy cost will be higher with a poor load-factor and a poor diversity-factor than if these factors are good. But this increase in the energy cost is usually disregarded; taking it into account would make matters too complicated.

We will also see that there are variations in the third part of the cost, the consumer cost or customer cost, which part we are to discuss in the next installment.

Insert VII—Appendix to Footnote of Section 45.

Mean and Weighted Average.

Where we have to deal with averages of fractions or ratios, we have to distinguish between the "mean" average and the "weighted" average. The *mean* average is formed in the same way as the average of all other values, that is, by adding the values and dividing the sum by the number of values which are to be averaged. For instance, the mean average of $\frac{1}{2}$ and $\frac{1}{4}$ is $\frac{1/2+1/4}{2}=\frac{3}{8}=0.375$. The *weighted* average is the sum of the numerators divided by the sum of the denominators. The weighted average of $\frac{1}{2}$ and $\frac{1}{4}$ is therefore $\frac{2}{6}=0.333..$, but the weighted average of $\frac{50}{100}$ and $\frac{1}{4}$ is $\frac{51}{104}=0.4093$; of $\frac{1}{2}$ and $\frac{25}{100}$ the weighted average would be $=0.2549$.

The weighted average applies to such cases where the fractions are ratios and the numerators as well as the denominators are the results of physical measurements or countings or other observations. It is clear that before taking the weighted average, the fractions must *not* be reduced by the elimination of common factors. The larger are the values of both numerator and denominator of a certain individual ratio resulting from a certain observation the greater is the relative importance or weight of the respective ratio if we are concerned with the "weighted average," hence that name. With the mean average every fraction or ratio has the same "weight" as every other one.

An example will make this clear. Supposing, for instance, we would be interested in the average density of population in two neighboring towns—a city and its suburb—the city *A* having a million inhabitants on an area of 50 square miles and the suburb *B* having 10,000 inhabitants on 2 square miles. *A* has therefore a density of 20,000 inhabitants per square mile and *B* 5000. It would be obviously incorrect to say that the average density of population in the two cities is the average of these latter two values, *i. e.*, 12,500 inhabitants per square mile (mean average). The lower density of *B* will have much less weight in influencing the average density because *B* is so small in comparison with *A*. The correct value for the average density is the aggregate population of the two cities divided by their aggregate area, that is the weighted average, $\frac{\text{sum of numerators}}{\text{sum of denominators}}$ or $\frac{1{,}000{,}000+20{,}000}{50+2}$ $=19{,}615$ inhabitants per square mile.

[9]The non-technical reader will find an explanation of the term power-factor in Insert X.

(To be continued.)

IMPORTANT FACTORS GOVERNING SOUTH AMERICAN ELECTRICAL TRADE.

Valuable Information Contained in Pamphlet Being Distributed by Guaranty Trust Co.

Considerable valuable information regarding the opportunities for the sale of electrical material in South America is contained in a pamphlet being distributed by the Guaranty Trust Co. of New York City. According to this information two factors play a dominant part in dictating the purchase of the materials used by railway, street railway, light and power, and other public service companies in this country.

The first of these is that South America does not itself produce any of this material and, consequently, it must be imported. The second factor is that nearly all such companies are financed by foreign capital and the almost irresistible tendency is for them to purchase their material in the country from which the capital comes. This second factor is declared to be the key to the entire situation and some pains are taken in the article to explain the policy and viewpoint of European peoples, as compared with our own, in respect of the persistence of nationality in corporations established abroad.

Each country of South America is taken up alphabetically and its general economic features considered briefly. There follows then a list, by groups, of the important companies in that country which use electrical supplies. The information in regard to these companies includes ownership, capitalization, extent of business, conditions of operation, etc. It is calculated to furnish the essential facts for those interested in extending their markets in those countries or in establishing new ones.

PLANS PREPARED FOR TUNNEL UNDER MT. BLANC.

Electric Railway of 50 Miles Proposed, of Which Tunnel Will Include 10 Miles.

A special cable dispatch, dated Aug. 3, from Rome, Italy, to the *Chicago Tribune*, states that negotiations are being concluded between a representative of a French syndicate and the Italian Government for the construction of a tunnel through Mount Blanc, which will be one of the greatest projects to pass through the Alps. Studies for the project have been going on for about fifteen years. It is now proposed to build an electric railway from Chamonix in Savoy to Amsta in the province of Turin, a length of 50 miles, whereof 10 will be under Mount Blanc. The new railway will join two of the most celebrated valleys with magnificent scenery and perhaps the most renowned among all picturesque cities of the Alps.

Factors Affecting Heat Absorption of Boilers

How Heat is Transmitted—Effects of Scale and Soot and the Importance of Removing or Preventing Them — Tests that Prove Advantages of Mechanical Soot Blowers

By ROBERT JUNE

Mechanical Engineer.

HEAT is transmitted to the water within a boiler by three processes,—radiation, convection and conduction. Radiation originates in the fuel bed, and hot furnace walls, convection in the hot traveling gases, and conduction is a function of the metal of the boiler. The generally accepted theory of the part each of these processes plays is illustrated in Fig. 1. In this illustration it is also shown that the heat has to penetrate five layers of interfering substances, namely, a film of dry, stagnant gas, a layer of soot, the metal of the tube, a layer of scale and a film of dry steam.

With the exact or relative values of radiation and convection, we are not here concerned, except to observe that on account of the limitations of refractory materials, there is no great hope of increasing furnace temperatures in this way in the immediate future, and that if we are to increase boiler capacity, it will have to be through agencies other than by convection. Inasmuch as we can greatly increase the amount of the boiler surface exposed to radiation, this is the principal line along which we are to look for improvement in boiler and furnace design.

Hardly less important, however, is the necessity for devising means of dispersing the dry gas and steam films on either side of the tube. These films are extremely poor conductors of heat. It has been found, as a result of experiments by Professor Nicholson, and the United States Geological Survey, that by establishing a powerful scrubbing action between the gases and the boiler plate, the non-conducting film of gas can be torn off as rapidly as it is formed, thus bringing new portions of the hot gases into contact with the tube, and thereby greatly increasing the rate of transmission. Similarly, the faster the circulation of the water, the greater will be the scrubbing action, tending to remove the bubbles of steam from the wet surface, and the more rapid will be the transfer of heat from the tube to the water. By filling up the tube of a Cornish boiler with an internal water vessel, leaving an annular space of only one inch around the latter, Professor Nicholson found that it was possible to drive the boiler to 800% of normal rating, with a flow of gases of 330 ft. per sec. This flow, which is 8 to 10 times the average, was maintained by a fan, utilizing about 4½% of the total power generated.

These factors in heat transmission have been mentioned because they presage certain important improvements sure to come in boiler and furnace design, and it is the duty of prospective boiler purchasers to be informed of them, to discuss them with the boiler manufacturers, and to lend every encouragement to the latter in their work of devising cheaper means of steam production.

Importance of Preventing or Removing Scale Formation.

Coming now to practical questions of every-day operation, it is found that the formation of scale is a factor of design only in a limited degree, being chiefly dependent upon the rate of driving and the nature of the scale forming ingredients in the feed water. That the formation of scale should be absolutely prevented by purifying the feed water, or that it should be removed as rapidly as it forms, by scale cutters, or "tube cleaners," as they are called, is one of the most elemental facts in efficient boiler room operation.

The loss in conductivity, due to the presence of scale, has never been reduced to a rule or formula, depending upon the thickness, or the degree of hardness and thickness or the chemical composition of the scale. The percentage of loss, therefore, can only be determined in each case by actual tests.

The following table shows the results of a number of tests of loss due to scale, made at the University of Illinois. It will be seen that the results are so varied as to prevent any detailed conclusions but they do point unmistakably to the very great loss caused by scale, running from 2% to 19%, and they also point to the previously stated very great necessity of absolutely preventing soot formation, or, failing this, its removal as soon as formed.

Influence of Scale on Heat Transmission.

Test No.	Thickness of scale.	Character of scale.	Decrease in conductivity due to scale, per cent.
1	.0	Hard, dense	9.1
2	.02	Hard	2.02
3	.033	Soft	4.3
4	.033	Very hard	3.5
5	.038	Medium	4.03
6	.04	Soft, porous	6.82
7	.04	Hard, dense	3.07
8	.042	Very soft	9.54
9	.047	Hard	2.75
10	.065	Medium	2.39
11	.07	Soft	2.38
12	.07	Hard	4.43
13	.085	Soft, porous	19.0
14	.089	Very soft	4.95
15	.11	Hard, porous	16.73
16	.13	Hard, dense	6.75

Dangers of Soot Accumulation.

Soot, as has been stated before in previous articles, is the most troublesome source of preventable waste in the boiler plant. With the exception of scale, all other losses are of such a character that when once located they may be practically eliminated for all time by the single application of corrective measures. This holds true of losses caused by air leakage in the setting, losses due to radiation, excess of air through the furnace, etc. But there is no means of preventing

the formation of soot. Its deposit on the fire surfaces of the boiler is an ever continuous process.

It is a matter of frequent surprise, not only to the layman, but to many men experienced in boiler room practice to learn that soot is the second best heat insulator known. Its lack of the property of conduction is so great that it has been proven to be more than five times as effective as fine asbestos in preventing heat transference; that is, more heat would reach a boiler through a 1-in. wrapping of asbestos than through a 1/5-in. coating of soot. To emphasize the importance of soot removal two tables, which appeared in a previous article by the author are reproduced herewith, together with a description of soot as found in the boiler plant.

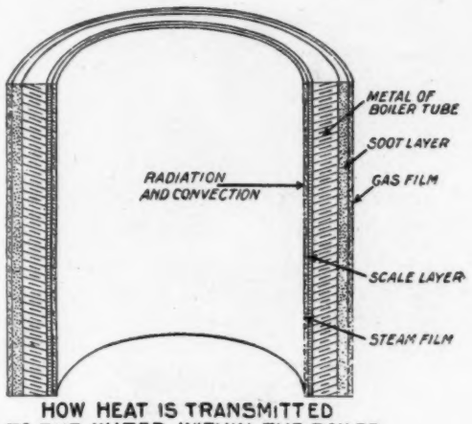


Fig. 1—How Heat Is Transmitted to the Water Within a Boiler.

The first of these tables, from Kent's Mechanical Engineers' Pocketbook, is as follows:

COMPARATIVE RESISTANCE TO HEAT.

Thickness of each substance..... 1 in.
Temperatures applied to each..... 310° F.
Temperature increase of water in each case..... 10° F.

Substances.	No. of pounds of water heated.
1. Loose wool	8.1
2. Loose lampblack (soot)	9.8
3. Hair felt	10.3
4. Carded cotton wool	10.4
5. Fine asbestos	49.0

A perfectly clean boiler tube, ⅛-in. thick will transmit 40 times as much heat as will a tube covered with a one-inch thickness of soot.

The loss in the heat conductivity of boiler plants due to soot deposits may be noted in the following table:

Thickness of soot.	Per cent of loss.
1/32 in.	9.5
1/16 in.	26.2
1/8 in.	45.3
3/16 in.	69.0

Fortunately, soot does not collect on all surfaces of a boiler in the same proportion. Some portions may be fairly clean, while others are thickly coated, but this does not lessen the fact that there is a considerable loss of fuel and heat wherever even a portion of the tubes are coated.

COMPOSITION OF SOOT.

The principal constituent of "pure soot," or lamp black, is carbon. Mixed and associated with this carbon, are various tar products and acids. In color, soot varies from black, to gray, grayish white, grayish green, grayish blue, brown and reddish brown.

Soot as found in steam boilers varies considerably in appearance and composition, depending upon the grade of coal burned, condition of combustion, and the part of the furnace from which the sample is taken. Nearest the fire, the deposits formed consist largely of ash. Analysis of samples of soot taken from the first pass of a boiler show, in addition to "pure soot," the presence of silica, alumina, iron oxide, various alkalis and sulphur dioxide.

In all but the coolest portion of the setting, soot is usually gritty in texture. The grains may be as large as medium sand, or as fine as cigar ash. These particles are in a plastic state when they leave the furnace, and striking the lower portion of the boiler, they adhere to the tubes. If this deposit is not removed frequently, it quickly increases in amount and changes in character. The carbon burns out in part and the mass cements together. The repeated reduction in heating surfaces, increases the temperature of the flue gases, so that the process of cementation is continuous and constantly increasing in intensity. An extremely hard clinker-like formation results and in a short time the space between the tubes in portions of the boiler will become entirely blocked, thus materially reducing its capacity. In this condition, mining operations alone will remove the deposits.

Another bad feature of these deposits is that if they are allowed to remain, the corrosive action of the various constituents of the soot is very apt to cause leaky tubes. Under the influence of heat, a ferrous carbonate is formed. The excess of air that is always present, brings free oxygen into contact with the ferrous carbonate, and the reaction produces ferric acid. Carbonic acid, particularly in the presence of free oxygen, acts very rapidly on the metal of the boiler. Another source of corrosion is the sulphur dioxide in the soot, which changes first to sulphurous acid, and then to sulphuric.

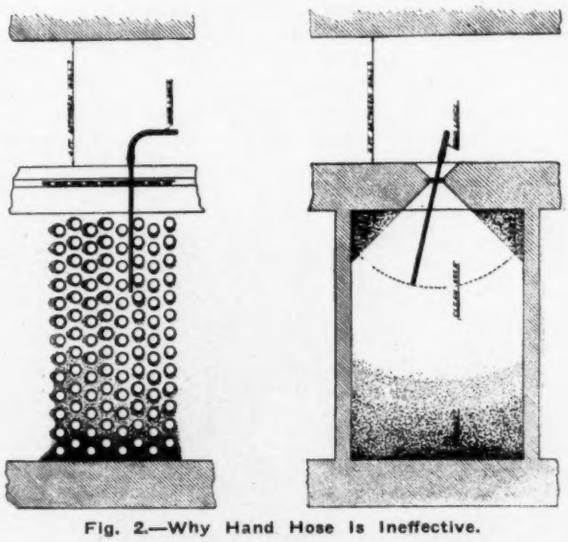


Fig. 2.—Why Hand Hose Is Ineffective.

Only the boiler-insurance companies know exactly how many boilers are condemned annually as unfit for operation on account of such action, years before their natural period of service would terminate. That the number is very high however, is generally admitted, for such cases are being constantly brought to light.

HAND CLEANING NOT EFFECTIVE.

It is a mistake to think that soot can be suitably removed by the hand-hose method using steam,

through a rubber hose and nozzle. The use of this system arose in the sheer necessity for removing some of the deposits from the tubes. It is admittedly an inefficient and expensive process, as well as being an extremely disagreeable, and, to a certain extent, dangerous one.

Two men are required in this process, one close up to the boiler setting, frequently on a ladder, and the other, at the steam valve. The time employed is usually from 20 to 30 minutes. The nozzle is inserted, the spray of steam goes into the boiler, but whether it reaches all of the soot-covered parts of that section can not be determined. For example, there is a section near the cleaning door which cannot be reached at all. In addition a large supply of steam is used and an immense amount of cold air is let into the furnace. When the hose is moved to the next location, some of the soot will be blown back.

Effects of Soot on Boiler Efficiency.

When the velocity of the gases over boiler surfaces is doubled and there is a corresponding increase in combustion rate and load, if the surface is maintained clean of soot coatings and ash deposits, two times as much heat is absorbed by each square foot of surface. The temperature of the waste gases is but little or no higher than of the gases formerly discharged from the boilers when they were operated at low loads, with a sluggish flow of gases, and soot-coated tube surfaces.

In both marine and locomotive boilers 10 lb. of evaporation per square foot of heating surface is common practice, higher than this being often obtained. There is, therefore, no real reason why stationary boilers may not be driven at these ratings. The principal requirements are scrupulously clean tubes, inside and outside, the latter requiring efficient mechanical soot cleaners.

Boilers must be cleaned more frequently when forced than when operated at rating, and the maintenance of both boiler and setting must be considered, and while this may appear to be against the use of

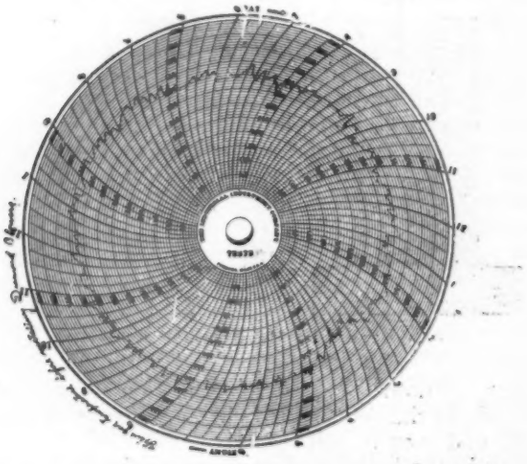


Fig. 3.—Flue Temperatures Before Installing Mechanical Soot Blowers.

high ratings, it is not as serious as it may seem. Boiler repairs and tube replacements under forced conditions are no more necessary than at lower ratings, provided the boilers are kept clean. If the boilers are to conduct heat as rapidly as possible to the water within the tubes, the steam is to be kept up when the soot piles up, more coal will have to be piled in.

The Five Essentials in Preventing Soot Waste.

The five essentials in preventing soot waste are:

1.—Frequency in cleaning. In order to minimize the cumulative effects of increasing deposits tubes should be cleaned three to six times a day.

2.—Thoroughness in cleaning. In order to maintain high furnace and boiler efficiency, and prevent

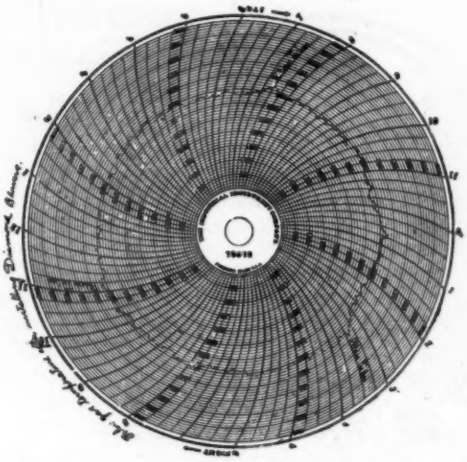


Fig. 4.—Flue Temperatures After Installing Mechanical Soot Blowers.

the destructive corrosive effects of soot accumulation.

3.—Availability of system. The soot-cleaner system should be instantly available, automatic in action, capable of rapid operation.

4.—Durability of system. The blower units should be so designed and constructed that they will withstand the stress of hard service, when placed in the hottest portions of the boiler, without the necessity for frequent repair or replacement.

5.—Economy of operation. The soot-removing system should require less steam and labor than hand-blowing; it should be installed so as to prevent the entrance of cold air into the furnace during operation; and, it should pay for itself from an investment standpoint.

The following figures from one of the largest electric plants in the country for a new and perfectly clean 1000-hp. horizontal water-tube boiler operated at 150% rating indicate the bad results of permitting soot accumulation:

Uptake temperatures for 1st day were an average of 550°.

Uptake temperatures for 2nd day were an average of 575°.

Uptake temperatures for 3rd day were an average of 600°.

Uptake temperatures for 4th day were an average of 625°.

Uptake temperatures for 5th day were an average of 650°.

These boilers were not cleaned and the figures given are good indication of the rapidity with which soot insulates the tube surface and cuts down economy as the time increases during which a boiler has been in service. An increase of 100° in flue gas temperatures in four days represents an increase in coal consumption of approximately 5%.

Tests Prove Soot Blower Savings.

The following data regarding soot-blower tests indicate the results to be expected by the use of soot

blowers. The first of these tests was made at the plant of the General Electric Co., Schenectady, N. Y., and indicates a 6% saving in fuel. The data was obtained from tests by A. L. Rohrer, electrical superintendent of the General Electric Co., in which he states:

"Replying to your inquiry concerning the trial installation of Diamond Soot Blowers, made in our power station here, I beg to say that perhaps I cannot do better than to give you some data obtained by several tests, each of which cover a period of two weeks. During tests both boilers had tubes blown twice in 24 hours, and in each case the same boiler was used for the hand-blown test. The data given is the average obtained during runs:

Before Using Soot Blower.				After Using.			
	Temperature				Temperature		
Time. A. M.	Stack.	Sup. steam.	Load meter.	Time, P. M.	Stack.	Sup. steam.	Load meter.
10:15.....	550	500	4.2	2:30.....	485	495	4.2
10:30.....	550	502	4.0	2:45.....	485	506	4.0
10:45.....	555	498	4.0	3:00.....	482	504	4.3
11:00.....	557	498	4.1	3:15.....	483	505	4.2

	Test results	
	Before.	After.
Load meter	4.075	4.175
Per cent rating	101.88%	104.38%
Steam pressure gage	199.5 lbs.	200.75 lbs.
Superheated steam temperature	499.5 F.	502.5 F.
Stack temperature	553 F.	483.75 F.

From Oct. 8 to Nov. 4, 1916, the General Electric Co. ran a comparative test of mechanical soot blowers

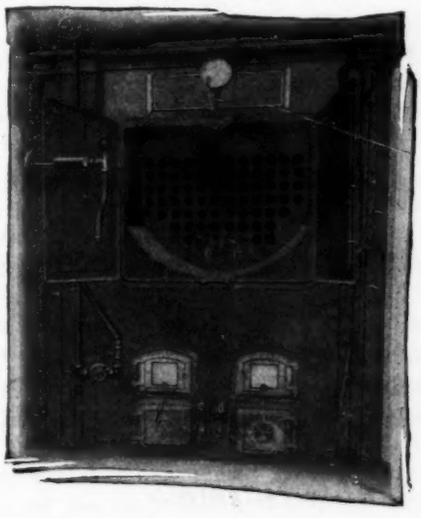


Fig. 5.—Mechanical Soot Blower in Return Tubular Boiler.

and the hand hose method on two 500-hp. boilers, set in the same battery, and identical in design, stokers, general equipment, and operating conditions. The results were as follows:

Average production of two boilers, 26 days—10,500,000 lb. steam.

Boiler No. 5, hand hose, at $0.17 per thousand	$1,785
Boiler No. 7, Diamond equipment, at $0.16 per thousand	1,680
Saving, 26 days	105
Estimated saving, 300-day year	1,260

	Hand hose method.		Soot blowers.	
Time of tests.	Flue temp.	Per cent rating.	Flue temp.	Per cent rating.
Two weeks ending Oct. 7....	586	128	553	140
Two weeks ending Oct. 20...	635	133	563	141
Two weeks ending Nov. 4....	630	126	560	154

The results of another soot-blower installation are contained in the data furnished by A. J. Fisher, chief engineer, on two 500-hp. boilers at the company's plant of the Miami Electric Light & Power Co.

Decrease in coal consumption since Jan. 1, when soot blowers were installed, 217.5 tons, or 6.5%. Increase in output for same period 294,682 kw-hr. or 25%. This represents a saving in coal alone for this period, Jan. 1 to Sept. 30, of $1196.25 over the same period of the preceding year.

From the tests made by J. A. Switzer, professor of Hydraulic Engineering, University of Tennessee, at the plant of Brookside Mills, Knoxville, Tenn., for the owners, the following data was obtained:

From the results of the test at boiler plant No. 1, made with a view of determining the saving effected by the installation of mechanical soot blowers, it appears that the saving brought about amounts to 7%. This represents a saving of one ton of coal during the 10 hours' period. Had the test covered a 24-hour period, so as to include the coal burned for heating the mill during the night, as well as for the hours of running, before and after the 10 hours' test period, the saving would amount to approximately 1¼ tons of coal. Accordingly it is perfectly safe to state that the soot blowers will completely pay for the cost of installation in somewhat less than six months' time. In view of the service which the soot blowers are rendering at this boiler plant, Professor Switzer strongly recommended that blowers be installed in boiler plant No. 2 of the company. In reference to the last, he stated that it was his belief that the soot blower would show a saving certainly not less than 10%.

From the tests made on two 822-hp. boilers using fuel oil at the plant of the Pacific Gas & Electric Co., San Francisco, it is shown that the soot blowing caused the temperature of the stack gases to fall from 553° F. to 483.75° F., making a difference of 69.25° F., or 13.05%. Also the temperature of the superheated steam was raised from 499.5° F. to 502.5° F., a raise of 3°, or 0.6%. The direct effect of the use of soot blowers, therefore, is a saving of 3.9%.

It will be observed that in every test the boiler equipped with mechanical soot blowers gave higher rating with lower flue gas temperatures and shows a higher efficiency in heat transference.

WINDMILLS USED ON DENMARK FARMS TO GENERATE ELECTRICITY.

During the coal famine caused by the war many attempts were made to improve the working of the windmills geared to dynamos to generate electricity. About 250 installations on farms and small estates have proved fairly satisfactory. Many experiments in this connection were carried out by the late Mr. P. la Cour, and a trial mill designed by him is still being used for observation purposes. During about one-third of the year there was either complete absence or excess of wind, and the force available was very variable. It was nevertheless found possible to save fuel for steam or gas-driven power producers. The cost per kilowatt from peat gas fired plants is approximately the same as from a windmill-driven installation. Attempts were made to design special three-phase dynamos capable of maintaining constant voltage independent of the speed of the mill, special attention being also paid to automatic adjustment of the sails in order to reduce the cost of attendance. A mechanical contrivance effects a turning movement of the sails so that during very high winds these occupy a position parallel to the direction of the wind, thus avoiding damage to the mill. Attention has also been paid to gearing and bearings to minimize losses in transmission from the sails to the dynamo.

Editorial Comment

Electric Drive on Hydraulic Dredges

HYDRAULIC dredges offer a large field for the application of electric drive and one that has only been barely touched up to the present time. On this account the description of the dredge operated by the City of Oakland, Cal., and the savings which it effects, as shown in the article by C. W. Geiger in this issue, should be of considerable interest to electrical men.

Undoubtedly this particular dredge in its operations is especially well adapted to the use of electric power but there are many others in various sections of the country which are operating under similar conditions and many more where a substantial saving could be made by the installation of motor drive.

Keeping After the Soot

SOOT is the arch enemy that interferes with the transfer of heat from the furnace gases to the contents of the boiler. By careful firing and combustion approaching the ideal, soot can be reduced, but not eliminated. Only those most closely concerned appreciate the amount of soot deposited upon heating surfaces of boilers and surfaces in close proximity during a day, a week or any other period of time, and in doing so acts as an almost perfect heat insulator.

But if the formation of soot cannot be prevented, it does not necessarily have to form a heat-insulating covering upon the heating surfaces. Prevention is better than cure, and soot should be removed with sufficient frequency from the boiler heating surfaces to prevent it from seriously interfering with heat transfer. The mechanical soot blower possesses the very real advantages that soot can be blown whenever conditions are thought to warrant, and without stopping steam making or taking a boiler or fire out of active service.

The mechanical soot blower would seem a necessity in these days when striving for economical boiler rooms. It is undoubtedly a necessity in the larger units with their high capacities and high rates of combustion. The mechanical soot blower is no longer an adjunct but a necessity in the large boiler room of today.

Carnegie and Haeckel

TWO famous men, both men of remarkable talents and drastic limitations, both in a peculiar sense the products and exponents of the later eighteenth century, both of a venerable age, have passed away within a few hours of each other. Carnegie, the Scottish-American ironmaster, and Haeckel, the German scientist, have passed out into the Great Unknown.

Carnegie, better than almost any other man, represented the industrial development which came with and followed the age of invention that began about 1870. Every new process in mining and smelting of iron or in the making and forging of steel paid Carnegie a profit. He did much, perhaps more than any other one man, to introduce efficiency into the steel industry, hence it was he who may be said to have been the sponsor of electricity in the steel industry. Incidentally, Carnegie was one of the first three men able to read the Morse code by sound.

As Carnegie typifies the later nineteenth century in industry, so Haeckel typifies it in science. Haeckel was a disciple of Darwin, only he was possessed of a dogmatism never seen in the gentle English student. To him, evolution was more of a deity than a truth, and he clung to the notion that there was no mystery but that would be explained in time with a fuller understanding of evolution. Haeckel was a militant missionary of science, unconsciously reflecting, perhaps, the influence of the militaristic society in which he lived and which he accepted with an almost child-like faith.

Both these men were of abounding talents, of kindly personality, both tireless workers. Both were keen investigators, daring in their divers ways and both were many-sided, brilliantly so. Both have served the world. To consider two such men together, their characteristics or their achievements, can only remind one of the infinite variety of the world.

Public Utility Dilemma

ALMOST every day comes to this office details of another municipally owned and operated light plant that has failed. Meanwhile the agitation for municipal ownership goes on, with its optimism, its falsehoods, prevarication, wrong theories and Utopian dreams.

High costs of fuel, of labor and supplies, loss of revenue and inability to do this and that are the reasons that so many of the municipal plants are going under. Meanwhile, privately owned and operated systems must keep going for the reason that they cannot quit. Their position is in many instances not an enviable one, for they must wait until relief comes in the form of higher rates of revenue or lower rates of expenditure, the former dependent upon public opinion, the latter upon world conditions.

The public and the politicians that allow the munic-

ipal plants to close down and cease functioning, are the same public and politicians that turn a deaf ear and refuse relief to the privately-owned plant that must keep on generating and distributing service. Is this fair play? And is it wisdom?

Psychology and Car Fares

WHILE the troubles of the traction companies were being aired before the Federal Electric Railway Commission in Washington, Secretary of War Baker, one-time mayor of Cleveland, expressed it as his opinion that the five-cent fare for street car rides in cities was a "psychological necessity," higher rates probably reducing the profitable short haul business. Mr. Baker admitted higher fares might be an emergency measure, "But if fares are raised," he said, "they ought to be raised by the people who are to pay for the increase. Otherwise it will be resented."

He who pays the piper calls the tune. Higher car fares should be granted, when granted, by those that will have to pay the higher fare. Higher fares ordered by commissions far-removed from the locality concerned will not meet with public sanction, but will tend, instead, to breed opposition and resentment. The company needing more revenue and seeking to obtain it by increasing its fares will do well to place the matter fairly and squarely before its patrons. This is the one and only way in which higher fares can be obtained without bringing with them ill-feeling.

Demand Cost and Diversity-Factor in Public Utility Service

FOR quite a few years it has been known that a high diversity-factor is an important means of reducing the cost of rendering central-station service. This means that serving many classes of customers with diversified demands spreads out or levels off the peak load and by thus reducing the necessary capacity of the central station decreases its fixed charges. The consequent reduction of the demand cost is thus closely dependent on the diversity-factor. Diversity of demands makes the reduction of the plant's generating capacity offset the cost of the distribution system and this, combined with the much higher efficiency and lower unit cost of large generating units accounts for the superior economy of the central station as compared with the isolated plant.

In the sixth of the present series of articles on "Central-Station Rates in Theory and Practice," by Mr. H. E. Eisenmenger, which appears in this issue, the author brings out very clearly the relation between diversity-factor and demand cost in central-station service and applies it in detail in several cases. The principles he brings out are applicable to all kinds of public utility service, although up to the present at least they have been applied to only a very limited extent outside of electricity supply service.

Failure to recognize the heavy additional cost of meeting the peak loads (rush-hour traffic) of street-car service is one of the reasons for the sad plight of so many traction companies at this time. The capital tied up in the great number of extra cars, heavy feeders and generating plant needed to handle the rush traffic of only a few hours each work day is idle the rest of the time. Consequently the fixed charges are greatly in excess of what they would be if the traffic curve were leveled of its peaks, which means more diversified service should be developed. On lines in industrial communities this may be difficult at first sight, yet spreading out of the peak load should not be difficult if effort is made to secure the co-operation of the industrial plant managers in spreading out the time of starting and quitting work. The supreme folly of this matter is the practice followed in quite a few industrial communities, up to quite recently of giving lower fares to workmen during the rush hours than at other hours of the day. We are not ready perhaps to accept higher fares during the rush hours than at other times, but this is the logical method of reducing the rush-hour traffic as well as apportioning the higher charges of this traffic among the passengers responsible therefor. At the very least the lower rush-hour fares should be abolished where they still are required and every effort made to spread out the traffic as much as possible.

Telephone service has its rush-hour traffic also, this requiring a much more expensive plant equipment than if the traffic were more evenly spread out. Telephone companies have not felt free to exact higher rates for peak-load service and it is doubtful whether they ever will. About the only effort made to develop use of otherwise practically idle equipment is the practice of offering lower long-distance rates during the night hours. Greater diversity of service is possible of development, however.

Water and gas supply companies have the same problem also, but seldom, if ever, attempt to reduce maximum demands by means of the rate schedule. Yet large reservoirs and gas holders are needed to meet the peak-load demands. There is no branch of public utility service that can not profit from consideration of the manner in which the central stations have met the problem by developing higher diversity-factors. Mr. Eisenmenger's articles therefore contain much of interest to other utilities and the managers of central stations are not the only ones that will find in them food for profitable thought.

Unification to Benefit Pacific Coast

INTERCONNECTION of generating systems received great impetus during the war on account of the saving of fuel and the availability of generating capacity obtainable thereby. When the emergency ceased the need for the remedy also abated, at

least so far as the need was less prominently acute. However, interconnection was found so beneficial in many instances that it has come to be a permanent measure instead of a war measure. And interconnection of different systems by different companies has in many cases come to be the unification into one company, as under some conditions it should be in the best interests of the public, the utility and the territory served.

It is in California that interconnection of systems made great progress both before and during the war. Distances were great, settlements were widely scattered, and water powers were numerous with varied stream flow, different pondage capacity and availability for utilization. By interconnecting sources of energy, stream flow could be utilized to the full, diversity could be taken advantage of efficiently, water power could be made to replace steam wherever possible and power available where not needed could be transmitted to markets where there was a shortage.

A number of important interconnections were made in California during the war, thereby saving oil and utilizing water power, but the war came to an end before ambitious plans could come to their full fruition. However, the benefits indicated were such that the movement has continued. The latest movement in this direction is the purchase of the Northern California Power Co. by the Pacific Gas and Electric Co. For some years the interests of these two large companies have been closely interwoven and during the war at the direction of the Power Administrator of California the two systems interconnected, the Northern California Power Co. thus becoming the central link in a chain of high-tension lines that reach from the mountains of Oregon to the Bay of San Francisco. It has already been prophesied that it will not be many years before a chain of interconnected transmission systems link up Oregon with the Mexican border. The acquisition of the Northern California Power Co. by the Pacific Gas and Electric Co., and the attention now being given to the adoption of 220 kilovolts as a commercial voltage lead one to expect that things will move apace during the next few years.

The unification of two large utilities, serving vast territories and harnessing many small water powers is pregnant with possibilities for California. The Northern California Power Co.'s property with its 525 miles of high-tension line, 1611 miles of low-tension lines, its six hydroelectric generating stations aggregating 50,000 horsepower on Battle and Crow Creeks respectively and its power site on the Pitt River representing potentially 90,000 horsepower will now enable the Pacific Gas and Electric Co. to expand to meet the ever-growing demands for power, develop latent power resources for utilization in the near future, and use existing water flow to best advantage. The unification of these two Californian utilities is of importance to the electrical industry as a whole and it is of greatest moment to the Pacific coast.

The Pacific Coast needs more industries, and industry consumes electric power. Interconnection spells fuel economy, conservation of water power and industrial development.

Industrial Unrest

INDUSTRIAL unrest is universal. From coast to coast, in almost every industry in the country has come discontent or smoldering discontent is on the verge of springing into flame.

Police, firemen, railroadmen, and others in positions of public trust have gone on strike or threatened to strike for shorter hours, higher rates of remuneration, or better working conditions, or from sympathy. While we clamor for a lower cost of living, labor is insisting upon conditions that not only precludes lowering the cost of living but must necessarily increase it. Unless something is done and done soon, this country will face an extremely acute and hazardous situation. We are heading at high speed toward a calamity.

It is natural that the World War that turned the world upside down, should be followed by upheavals and readjustments. It was inevitable. But the tendency of these upheavals, these movements, is for labor to prosecute its own interests without taking into consideration the interests of others. Labor today is passing through a much exalted opinion of itself and its value to the world, and it is this latter that, after all, is the criterion of worth. If labor would serve its own best interests and those of the country as a whole—and the need for patriotism is with us still—labor would do well to tackle the urgent and complex problem of lowering the cost of living instead of making things worse by insisting upon higher wages, wages in many instances out of all proportion to intrinsic worth. To do the former would strike at the root of the problem; doing the latter is no solution, not even a palliative to the most pressing problem this country faces today.

No country can continue to progress healthily unless its progress is founded upon a firm basis. Inflated prices and labor costs and an excessively exalted opinion of labor for itself and its value to the community do not work for this condition. The value of labor itself depends not upon itself alone but upon those using and utilizing its labor.

We need more give and take, closer harmony, co-operation and mutual appreciation of moral obligations between capital and labor, the curtailment of the profiteer to a point where he ceases to be a menace to our national life, that all can start again, energetically, the work of peace, and bring about increased production, better distribution and fair play all round. For it is these three, increased production, better distribution and fair play, and these alone, that will bring about lower cost of living and industrial rest.

Current Events

Program for Illuminating Engineers' Meeting—New Code Committees—Chicago's Electrical Show—Convention Plans

BROAD PROGRAM FOR ILLUMINATING ENGINEERING SOCIETY CONVENTION.

Topics of Interest to All Branches of Lighting Industry to Be Included in Program of Chicago Convention.

A tentative list of subjects to be included in the program of the 1919 convention of the Illuminating Engineering Society at Chicago, Oct. 21 to 24, inclusive, has been announced by the Papers Committee, of which George H. Stickney, Harrison, N. J., is chairman. A "high spot" at the beginning of the program will be the report of the Committee on Progress which will review not only the normal progress of the year, but the lighting developments during the war, including, if possible, some of the new things which heretofore have not been openly discussed. Searchlights, their development and application during the war, will be another interesting feature.

A paper on "Viaduct Lighting" will describe an installation made without poles or posts and involving an unusual and interesting method of distributing light over the roadway with provisions for reducing glare; this paper is to be accompanied by illustrations and curves. The gas-lighting industry will be represented with a paper on gas street lighting, its present status and recent developments. Recent developments in equipment and applications of electric street lighting will also be discussed.

A paper which will not be printed in advance is one on prospective lighting applications. This will be a "ginger" talk, pointing out the extensive and as yet undeveloped field for the wider application of artificial lighting.

For the industrial man there will be several papers. One entitled "Industrial Lighting" will give data and descriptions of good lighting installations recently put in under the advice of experts of important central stations; figures on burning hours, etc., will be included. What the manufacturer says he is doing in regard to good industrial lighting will be brought out in a paper entitled "Industrial Lighting Survey."

The recent movement for lighting codes for various states has been recognized by placing on the program a symposium on the application of industrial lighting codes. State experts will give their experience in applying and enforcing these codes. Results of insurance companies' inspections will also be brought out; the importance of insuring industrial safety by means of regulations of lighting will center much interest on this topic.

A message from the merchandiser to the illuminating engineer will be included in a paper entitled "Illuminating Engineering and Merchandising." This paper will tell how to encourage better lighting practice among dealers of lighting equipment. A paper on "Hospital Lighting" will bring out what illuminating engineers believe is good practice as exemplified by modern installations.

There is also enough of the technical in the program to make it well balanced. "Tests of Lighting Units" will bring out facts about photometric and illumination tests of typical units for interior lighting. "Diffusion of Light" will discuss a study of glare and diffusion in their relation to practical lighting installations. "Distribution of Light in Rooms" is an analysis of natural and artificial lighting with regard to wall finish, window openings, shading, etc. A paper on the "Reflecting Power of Paint" will contain data from careful tests of different colored paints. "Photometry" is the title of a paper which will bring out some ingenious methods of making difficult measurements.

From the foregoing condensed summary of the principal topics, it is evident that the program will not neglect any of the chief lines of lighting activity, commercial and practical as well as academic and theoretical. For this reason it is hoped that the convention will attract many men from every branch of illumination science and art.

MUNICIPAL ELECTRICIANS TO HOLD INTERESTING CONVENTION.

Four-Day Meeting Being Planned in Chicago Sept. 23-26—Exhibits and Entertainment Not to Be Neglected.

Arrangements are rapidly being perfected for the 24th annual convention of the International Association of Municipal Electricians which will be held at the Auditorium Hotel, Chicago, Sept. 23-26, inclusive. The technical program cannot yet be announced, but it can be stated that it will include reports, papers and addresses on timely topics of unusual interest. An exhibit by manufacturers of electrical apparatus and supplies used by municipal electrical departments will be a feature supplementing the program. An entertainment program is being worked out that will provide relaxation between the sessions and pleasant diversion for the ladies during the technical sessions. Clarence R. George, Houston, Texas, is secretary of the association, and William S. Boyd, 175 West Jackson boulevard, Chicago, is secretary of the local committee on arrangements.

COMMITTEES APPOINTED TO REVISE NATIONAL ELECTRICAL CODE.

Persons Interested in Code Revisions Invited to Communicate with Subcommittee Chairmen.

The following special committees have been appointed by the chairman of the Electrical Committee of the National Fire Protection Association to consider various questions in anticipation of the 1920 Code. All persons interested in any of these questions are invited to communicate with the chairman of the technical subcommittees as given below.

These subcommittees grouped under the standing

committees through which they will report are as follows:

1.—Standing Committee on Cars and Railways: M. Schreiber, chairman, American Electric Railway Association, Newark, N. J.; R. C. Bird, Ralph Sweetland. In the revision of rules on carhouse wiring and car wiring for more than 600 volts the American Electric Railway Engineering Association has appointed two committees to co-operate with the standing committee.

2.—Standing Committee on Devices and Materials: A. R. Small, chairman, 207 East Ohio street, Chicago; H. O. Lacount, H. R. Sargent.

Technical Subcommittees:

(a). Wires and Cords: Stranding, identification, types, etc. B. H. Glover, chairman, 207 East Ohio street, Chicago; G. E. Bruen, V. H. Tousley, G. S. Lawler, H. A. Morss, W. S. Clark, W. F. Field.

(b). Cabinets and Cutout Boxes: A. O. Boniface, chairman, 207 East Ohio street, Chicago; E. C. Horton, L. L. Johnson and representative of American Society of Mechanical Engineers.

(c). Outlet Boxes and Covers: E. P. Slack, chairman, 25 City Hall Place, New York; F. D. Varnam, L. A. Barley, H. G. Knoderer.

(d). New 10-Amp. Classification of Fuses: A. R. Small, chairman; W. C. Peet, H. R. Sargent.

3.—Standing Committee on Fixtures, Heaters, Signs and Lamps: J. C. Forsyth, chairman, 123 William street, New York; G. E. Bruen, C. H. Lum.

(a). Heaters: J. C. Forsyth, chairman, 123 William street, New York; I. Osgood, R. B. Shepard, H. J. Mauger, Harold Fulwider, Frank Kuhn, C. J. Killam.

(b). Fixtures and Insulating Joints: J. C. Forsyth, chairman; Emil Anderson, K. W. Adkins, A. Waldschmidt, V. H. Tousley, C. H. Hill, H. S. Wynkeep, Louis McCarty and representatives of the National Fixture Manufacturers' Association.

(c). Incandescent Lamps, Gas-Filled, Use of Lamps in Dusty Places: G. E. Bruen, chairman, 123 William street, New York; F. F. Burroughs, R. P. Strong, W. T. Blackwell.

(d). Extensions from Fixture and Other Outlets: G. E. Bruen, chairman, 123 William street, New York; E. H. Joseph, and representative of Outlet Box Manufacturers.

4.—Standing Committee on Generating and Substations: A. M. Schoen, chairman, Southeastern Underwriters' Association, Atlanta, Ga.; W. H. Blood, K. W. Adkins.

The following topics to be treated by this standing committee: *a*, use of switches between generators and transformers; *b*, revision of rule 1-d on fusing of generator sets.

5.—Standing Committee on Grounding: W. H. Blood, chairman, 147 Milk street, Boston, Mass.; C. M. Goddard, H. S. Wynkoop.

(a). Grounding Motor Frames: W. H. Blood, chairman, G. S. Lawler, W. C. Peet.

The standing committee has under consideration the following topics: *a*, Size of ground wires; *b*, voltage limits for grounding; *c*, omission of grounding for short lengths of conduit, metal raceways, etc.; *d*, minor items of Rules 15 and 15A that relate to grounding.

6.—Standing Committee on Industrial Applications: G. S. Lawler, chairman, 31 Milk street, Boston, Mass.; F. Osgood, C. B. Langdon, J. M. Curtin.

(a). Fuse Protection of Motors: E. E. Turkington, chairman, 31 Milk street, Boston, Mass.; J. C. Forsyth, E. McCleary, W. J. Canada and a representative of the Electric Power Club.

(b). Use of Oil Transformers, Autostarters and Motor-Starting Devices: C. B. Langdon, chairman, 266 Pearl street, Hartford, Conn.; F. O. Evertz, F. A. Barron, T. C. Taliaferro and a representative of the Electric Power Club.

(c). Demand Factors in Wiring: Bassett Jones, chairman, 101 Park avenue, New York; C. H. Hill, A. M. Paddon, A. S. Adams, H. B. Gear.

(d). High Potential Wiring: G. S. Lawler, chairman, 31 Milk street, Boston, Mass.; W. S. Boyd, A. E. Silver, D. W. Roper, C. C. Harbinson.

(e). Use of Enclosed Switches: Washington Devereux, chairman, Bullitt building, Philadelphia; Ben W. C. Clark, H. F. Strickland, P. H. Bartlett and representatives of the Associated Manufacturers of Electrical Supplies and of the Electric Power Club.

(f). Fireproof Switchboard Rooms and Running Mains in Hazardous Rooms, etc.: A. M. Paddon, chairman, Gurney building, Syracuse, N. Y.; C. B. Langdon, W. S. Boyd, E. E. Turkington and C. H. Hill.

(g). Housing of Motors in Dust Places, etc.: F. F. Burroughs, chairman, Mutual Fire Prevention Bureau, Oxford, Mich.; H. W. Hadlock, and representatives of the Electric Power Club and of flour and elevator insurance companies.

(h). Revision of Code Rule No. 88: W. C. Peet, chairman, Peet & Powers, 70 East 45th street, New York; H. S. Wynkoop, R. P. Strong.

(i). Electrical Equipment of Lacquer and Varnishing Rooms: A. C. Hutson, chairman, National Board of Fire Underwriters, 76 William street, New York; O. E. Smith, H. S. Wynkoop.

7.—Standing Committee on Outside Wiring, Building Supply and Services: M. G. Lloyd, chairman, Bureau of Standards, Washington, D. C.; C. H. Hill, F. F. Burroughs. This committee has under consideration the following: *a*, transformer vaults; *b*, location of service conduit near combustible material; *c*, supports for service wires on buildings; *d*, enclosed service switches; *e*, revision of Rule 12-d; *f*, sizes of service wires and use of multiple conductor wire for services.

8.—Standing Committee on Signal Systems: W. S. Boyd, chairman, 175 West Jackson boulevard, Chicago; A. M. Paddon, C. W. Mitchell. This committee with the following will act as subcommittee on revision of Rule 85 of the Code: F. A. Raymond, C. C. Johnson, H. S. Warren, Frank Bean, S. L. Burgher.

9.—Standing Committee on Theaters, Moving Picture Establishments, Places of Public Assembly and Garages: Washington Devereux, chairman, Bullitt building, Philadelphia; V. H. Tousley, C. M. Tait.

(a). Theaters and Moving Picture Wiring Standards: Washington Devereux, chairman; F. A. Barron, B. A. Hanson, C. M. Tait, V. H. Tousley, Joseph Honey, J. C. Moulton.

(b). Exit Light Transformers, low voltage: V. H. Tousley, chairman, City Hall, Chicago; F. A. Barron, B. H. Glover.

(c). Elevator Wiring Standards: Washington Devereux, chairman; W. Doane, C. H. Hill, A. Marks, O. P. Cummings, I. N. Haughton, O. F. Shepard.

(d). Film Rewinders: W. A. Lodge, chairman, 207 East Ohio street, Chicago; L. M. Swaab, F. H. Richardson, Lee Johnson, H. N. Speer.

10.—Standing Committee on Wiring Standards and Systems: W. C. Peet, chairman, Peet & Powers,

70 East 45th street, New York City; Dana Pierce, F. Overbaugh, R. P. Strong.

(a). Conduit Work, Sizes of Wires, Distance Between Pull Boxes, etc.: G. M. Sanborn, chairman, Sanborn Electric Co., Indianapolis, Ind.; A. O. Boniface, John Cole, O. E. Smith.

(b). Wattage Limits for Branch Lighting Circuits: I. Osgood, chairman, 55 Kilby street, Boston Mass.; Bassett Jones, Milton Jones, Albin Gustafson.

(c). Farm Lighting Equipments: Dana Pierce, chairman, 25 City Hall Place, New York; B. H. Glover, C. A. Bates, H. L. Bunting, F. F. Burroughs, W. S. Boyd, C. H. Hill, R. W. E. Moore, R. H. Grant, W. Michaelson, J. E. Cross.

(d). Voltage Limit for Low Potential Systems: W. C. Peet, chairman, Peet & Powers, 70 East 45th street, New York City; H. O. Lacount, H. R. Sargent, C. B. Langdon.

(e). Wiring in Places Subject to High Temperatures: H. S. Wynkoop, chairman, Municipal building, New York City; E. McCleary, R. P. Strong.

(f). Interbuilding Connections: H. S. Wynkoop, chairman, Municipal building, New York City; other members to be appointed.

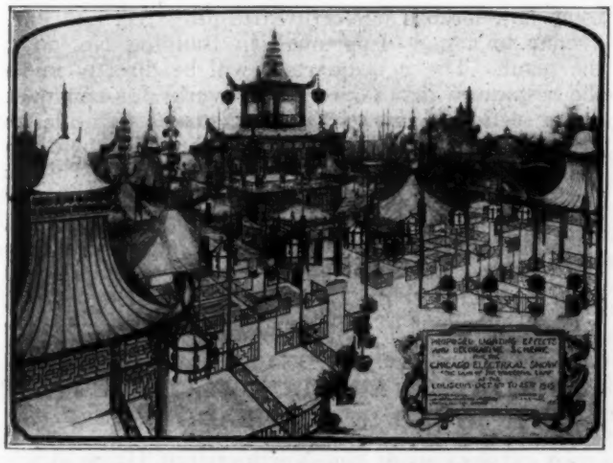
(g). Extension Wiring in Fireproof Buildings: Committee to be appointed.

"LAND OF THE WONDERFUL LAMP" TO BE ELECTRIFIED.

Chicago's Electrical Show, Oct. 11 to 25, Promises to Be Worth Coming Miles to See.

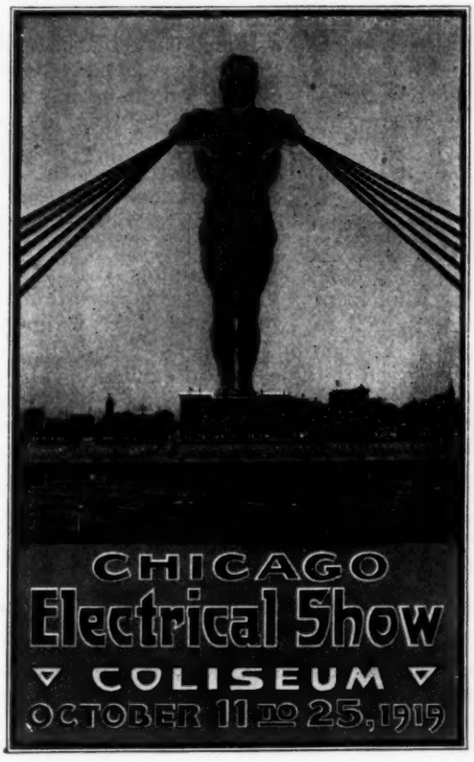
According to all indications Chicago's Electrical Show, which is to be held at the Coliseum Oct. 11 to 25 inclusive, will surpass any ever held by the electrical interests in this city and will be comparable with those held by this or any other industry any place. More than 80% of the available exhibition space has already been allotted and the elaborate decorative and lighting effects have practically been completed.

The setting of the show was designed in accordance with the most modern ideas in attractive merchandise display and at the same time the scene is destined to leave a lasting impression with all who view it. The setting is Chinese, an exemplification of the electrification of the wonderful Aladdin lamp of fable fame, and the typical oriental colors will dominate. It was designed by W. D'Arcy Ryan and J. W. Gosling of the General Electric Co., Schenectady, N. Y., whose work at the San Francisco's world's fair and many other similar affairs are well known.



General View of Decorative Effects and Scheme of Illumination. Planned for Chicago Electrical Show, Oct. 11 to 25.

In the center of the hall a large Chinese pagoda will be erected. This pagoda will be brilliantly decorated and ornamented by 18,000 "Novagem" jewels from the "Tower of Jewels" at San Francisco. Surrounding this pagoda other booths will be arranged in typical Chinese fashion and decorated to fit in with the rest of the setting. A white false ceiling will be placed over the whole, terminating at both ends with drops painted to represent Chinese scenes.



Attractive Poster Being Used to Advertise Chicago's Electric Show.

The lighting effects have been especially designed to enhance the general decorative scheme. For local lighting hundreds of imported silk and gauze Chinese and Japanese lanterns, equipped with electric lamps will be used. In addition numerous flood lights and projectors will be installed in the balcony. Modern projectors having a total electric consumption of 32 kw. will play on the jeweled pagoda from all angles. The light from others using a total of 28 kw. will be reflected from the white ceiling upon the entire display and several more will be directed upon the scenic drops. Over all a lighting effect similar to an aurora borealis will be created by a 9-kw. searchlight.

The management of the show, however, has gone further than providing an impressive setting. Special pains have also been taken to make the exhibit itself of interest to visitors. For this reason a representation from all classes of electrical manufacturers has been secured which will include all the latest and best electrical devices and applications. It should therefore prove of interest to industrials as well as laymen and manufacturers should send their electricians, plant superintendents and foremen to the show to see the latest devices developed for transmitting and using electricity.

The usual line of well-known electrical appliances

and devices will of course be shown in the latest types and models and in addition, apparatus for heat treating, electric furnaces, electric welding, electric ovens, modern lighting equipment, socket devices, electric tools, reflectors, storage batteries, motors, controllers, electric vehicles, transformers, automatic switches, fuses, wiring devices of all kinds and ventilating equipment will also be exhibited.

The time of the show is also particularly favorable. Although Chicago is known as the convention city there are few periods of like length during the year when as many conventions are held as in the two weeks selected for the show. Among the associations to convene in the city during this time are the Illuminating Engineering Society, Illinois Electrical Contractors Association, Illinois Electrical Association, American Association of Railroad Surgeons, National Dairy Show, Grand Lodge of Illinois A. F. and A. M., National Implement and Vehicle Association, Polish National Council of America, and the Railway Fire Protection Association. Special attention will, of course, be given to the electrical conventions held during this time and in addition efforts will be made to have the delegates at the other conventions attend.

E. W. Lloyd, 72 West Adams street, Chicago is manager of the show.

CIVIL-SERVICE EXAMINATION FOR JUNIOR ELECTRICAL ENGINEER.

Applications for $1080 to $1200 Position Will Be Received Until Further Notice.

The United States Civil Service Commission, Washington, D. C., announces an open competitive examination for junior electrical engineer to fill vacancies in the Bureau of Mines, Department of the Interior, for duty at Pittsburgh, Pa., or elsewhere. The salary is $1080 to $1200 a year, with temporary increase of $240 a year granted by Congress if services are satisfactory. On account of the needs of the service, applications will be received until further notice. Applicants must not have reached their thirtieth birthday on the date of making oath to the application.

Competitors will not be required to report for examination at any place but will be rated on the following subjects: Physical ability, 10; education and experience, 90. Graduation from a four years' course in electrical engineering in a college or university of recognized standing, and at least one year's experience in electrical engineering work outside the college are prerequisites for consideration for this position.

Applicants should at once apply for Form 1312, stating the title of the examination desired, to the Civil Service Commission at Washington, D. C., or at one of the district offices.

CHARLES SCHWAB TO ADDRESS MINING AND METALLURGICAL ENGINEERS.

Plans for Annual Convention in Chicago, Sept. 22 to 26, Practically Completed.

Charles Schwab will be a speaker at the banquet of the American Institute of Mining and Metallurgical Engineers to be held in conjunction with its annual convention in Chicago, Sept. 22 to 26 inclusive. Elaborate plans for both the technical and social side of the meeting have been perfected. Engineers who make the trip to Chicago for this meeting are assured of one of the most interesting annual meetings which the Institute has held. In addition to some hundred and fifty papers which have been prepared for the meeting, trips to the zinc smelting districts, the steel works at Gary and the refineries at Whiting and East Chicago are included. A boat trip on the lake together with numerous social events have been arranged for the ladies. The fifth annual exposition of the Chemical Industries will be held in Chicago at the same time as the meeting of the American Institute of Mining and Metallurgical Engineers and members of the Institute are cordially invited to attend.

ELECTRIC VEHICLES TO BE SHOWN AT NEW YORK ELECTRIC SHOW.

The New York Electrical Exposition, which is to be held during the 10 days beginning Sept. 24, at the Grand Central Palace, will have among its exhibits several displays by the leading manufacturers of electric automobiles.

In the commercial car section will be seen different sizes and types of trucks built by the Ward Motor Vehicle Co., the Commercial Truck Co. of America, and the Walker Vehicle Co. Passenger cars will be exhibited by the Baker R & L New York Corporation, and by the Metropolitan Detroit Electric Automobile Co.

Storage-battery manufacturers will be represented by the Electric Storage Battery Co. and the Philadelphia Storage Battery Co.

Another exhibit of particular interest to automobilists will be that of the Bennage Co. This exhibitor will show a new type of electrically heated vulcanizer.

NEW QUARTERS FOR BLIND SCHOOL AT CROCKER-WHEELER WORKS.

The Double Duty Finger Guild of the Crocker-Wheeler Co., Ampere, N. J., an organization for the instruction of the blind that was developed by Dr. Schuyler Skaats Wheeler about two years ago, is arranging to move its headquarters and main workroom now located at North Fifteenth street and Park avenue to a new department in Building No. 70 at the plant. The new quarters will be directly under the restaurant maintained at the works for employes, and a section of this lunch room is to be set aside for the blind workers. This organization, under the direction of Dr. Wheeler, has been highly successful; at the present time about 24 blind workers are engaged in coil work, including taping, insulating, etc., and 10 other blind workers are now being employed in the regular plant with normal workmen after having been instructed at the Guild. Mrs. Ida Hirst Gifford is superintendent of this department.

HOUSEHOLD APPLIANCE CONVENTION HELD IN MINNEAPOLIS.

A convention of the Northwestern Home Appliances Association was held at the Radisson Hotel, Minneapolis, Minn., Aug. 14 to 16. This is an association composed of dealers associated with the Sterling Electric Co. of Minneapolis, the Kelley Hardware Co., of Duluth, and others. Among the manufacturers represented in the association are the United Electric Co., Canton, O., American Ironing Machine Co., Chicago, Pittsburgh Gauge & Supply Co., Pittsburgh, and the Rudd Heater Co.

Commercial Practice

House Shortage Creates Demand for Service — British Plan for Vehicle Business — Successful Washer Campaign

SCARCITY OF HOUSES CREATES DEMAND FOR ELECTRIC SERVICE.

Georgia Railway & Power Co. Reports Great Activity as the Result of Housing Conditions.

The scarcity of houses that is prevalent throughout the country at present, appears to be particularly evident in Atlanta, Ga. As a result, houses that probably might never have been wired for electric service or piped for gas are getting both these days, and the demand on the contract department of the Georgia Railway & Power Co. is greater than it ever has been at this time of the year, according to W. R. Collier, sales and operating manager.

The demand in that city is so great that people are buying and renting homes for their own use which, under normal circumstances, they would not have been willing to consider. In order to make these homes as comfortable as possible they are being improved by the installation of modern conveniences which naturally includes provisions for the use of gas and electricity. In addition, the owners of buildings wishing to take advantage of this demand and realizing the increased value of their property if equipped for such conveniences, are taking steps to have them installed.

Mr. Collier points out further that there is a large number of new houses being erected and all of these are being provided with both gas and electric service which adds to the company's activity.

ELECTRIC VEHICLE BUSINESS IN ENGLAND.

Electrical Development Director Urges Loaning of Vehicles in Order to Encourage Sales.

J. W. Beauchamp, Director of the British Electrical Development Association, writing in the official organ of the Electric Vehicle Committee, urges electric vehicle manufacturers and electric supply undertakings in England to consider the question of letting out vehicles on trial to possible customers. He says it would not be beyond the resources of some of the central-station companies to offer to possible customers the use of an electric truck with a driver for, say, one month, the vehicle and driver to be entirely at the disposal of the customer for his ordinary cartage business and to be charged and garaged by the central station. At the end of the month the cost of the month's cartage service based on figures for electricity, labor, depreciation, etc., which would be exactly comparable with his own costs if he were to buy the vehicle, would be charged.

Mr. Beauchamp thinks that in many cases it would be found that at the end of the month the customer would be very unwilling to part with the vehicle and the trial would bring home to him as nothing else could the advantages and economy to be achieved in the running of an electric for certain classes of cartage and haulage work. Obviously it would be best to attack the user of horse vans at first and to select cases where considerable loads are conveyed over limited distances. The most effective canvassing consists in the loan of a vehicle with an accomplished and obliging driver who will endeavor to get the best out of it and show to the prospect its full possibilities and advantages.

"Lending vehicles out in this way," says the director, "cannot of course be carried out on an extensive scale unless there are considerable numbers available, but if only one general service lorry were employed for a year on such work, being lent to 10 or 12 different persons and particularly to large organizations in the district, such as municipal undertakings, express and freight companies, coal merchants and general cartage contractors, it would probably result in orders much more quickly than ordinary canvassing and publicity efforts."

Although the possibilities of the latter in relation to the electric vehicle business have been by no means fully explored, Mr. Beauchamp comes to the conclusion that the electric vehicle does its own publicity work very well—that is to say, it may be difficult to induce a large organization to purchase the first one, but when that is accomplished the work is done, and the fleet grows without further canvassing.

MAKING THE WASHING MACHINE CAMPAIGN A SUCCESS.

Two Schemes Used by Eastern Montana Light & Power Co. in Recent Campaign.

Perhaps the most prominent of the electrical devices being advertised and sold at present is the electric washing machine. No doubt the great scarcity of household labor and the growing tendency of the modern American husband to lighten his wife's labors are partly responsible for this, but nevertheless, the clever advertising schemes of the manufacturers and the original efforts of local dealers and central stations, have done much to stimulate this demand.

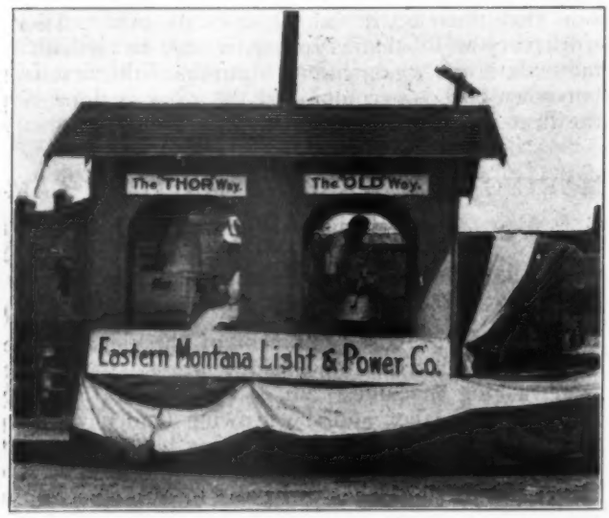
Two such schemes are illustrated herewith. They were used by the Eastern Montana Light and Power Co., Glendive, Mont., of which E. J. Condon of Chicago is president and John M. Culver, sales director, in a recent campaign on Thor electric washers.

In the first scheme, the washer was placed on the roof of the company's building and was illuminated by a number of colored lights placed in the form of an arch above. To add to the effect a number of silk flags were strung from the washer to the arch above which made the effect at night very beautiful. The entire building was also covered with bunting and the show window was attractively decorated with potted ferns and flowers among which smaller electrical appliances were displayed.

The second scheme, which also served to prove the public spiritedness of the company, was a float that took part in a civic parade. On this float a two-room house was built which was suitably decor-

Clever Scheme of Advertising Electric Washers.

ated and arranged so all could see its interior. In one room, called the old way, an old black mammy rubbed over a tub of foaming suds in a vain endeavor to bring the spots out of a soiled garment. In the other room, called "the Thor way," a neatly attired



Central-Station's Float That Won First Prize in Civic Parade.

housewife sat in a rocking chair, reading a magazine, while the electric washer did the work. Needless to say, this float won first prize and also that the campaign proved successful.

LOUISVILLE, KY., CITY HALL GENERATING PLANT ABANDONED.

The City of Louisville, Ky., which for many years has operated an electric generating plant to supply current for the City Hall and annex, has decided to abandon the generation of current and will hereafter purchase its requirements from the Louisville Gas & Electric Co. The business which will be connected by the company soon, amounts to approximately 250 hp.

COMMISSION HOLDS ELECTRIC AND GAS BRANCHES ARE SEPARATE.

New York Commission Also Decides That It Is Time to Consider Situation from Peace Standpoint.

The Public Service Commission of New York, Second District, recently rendered an interesting decision in a complaint against the Central Hudson Gas & Electric Co. Some time ago the commission authorized this company to increase its gas rates from $1.25 to $1.50 per M cu. ft. which resulted in the complaint being filed by residents of Poughkeepsie and Newburgh. Evidence was taken at the critical period of the war and the Commission was reluctant to determine a rate on evidence or conditions at that time. Representatives of the Poughkeepsie complainants desired that the investigation include electrical operations, on the theory that the price of gas should not be increased even if the gas operations should be found unprofitable provided the company as a whole was earning a fair return. Commissioner Irvine declined to receive the evidence on the ground that the two branches of the business must be considered separately and that electric consumers could not be required to make up a loss on the gas business. In a memorandum of the Commission he says doubt was expressed on this point and a case was pending demanding its judicial determination. This case was decided in accordance with the theory expressed by Commissioner Irvine.

The Poughkeepsie complainants were informed that there was no complaint against the company's electric rates, but if one were filed, as provided by the statute, the two matters would be disposed of at the same time. No complaint was filed.

Commissioner Irvine, in reviewing the evidence presented, said:

"An estimate of operating results for 1919 involves too many elements of conjecture to render it of much service. There is nothing to indicate a substantial addition to revenue. It is to be hoped and only hoped that expenses may decrease. It is not probable that the return can exceed 7%. During the war the Commission was inclined when rate adjustments became necessary, to permit increases only far enough to meet operating expenses, taxes and interest on bonds or, in other words, merely to insure solvency. The time has now come when we may properly consider a fair peace time return on the investment. It is necessary to do so if utilities are to be preserved and capital invited in order to make extensions and betterments essential to the rendition of proper service. A return of 7% or less can not be considered an unduly large return. It may be that coal prices and oil prices, and perhaps some other elements of cost, will soon decrease to such an extent as to warrant a lower rate. On the figures before us we cannot hold that the present rate is at the present time unreasonably high and the complaints must, therefore, be dismissed, but the current schedule should not be fixed for a period longer than one year. It is true that the corporation has been paying dividends during the two years under special examination of 8% and that in 1918 the corporate surplus was increased by the amount of $5524. This indicates higher earnings on the electrical side than on the gas side, but, for reasons already stated, the electrical operations are not before the Commission, and therefore no opinion is expressed or even entertained as to the reasonableness of the electric rates."

Operating Practice

Leaky Rock-Filled Dams — Manhole Ladders in Cleveland — Operating Results with Mechanical Soot Blowers

DETECTING AND REMEDYING LEAKY ROCK-FILLED DAMS.

Simple Expedients to Be Followed—Precautions to Be Observed.

By W. F. Snyder.

There are numerous hydroelectric plants and mills, principally in the smaller installations, in which the leakage through rock-filled timber dams assumes such proportions that it materially decreases the amount of power available. The dams of this type of construction are usually sheeted on the upstream side and after a while the sheeting deteriorates and the water passes through in ever increasing volume. Ordinarily this is of no great consequence for it can be resheeted. If, however, the sheeting was not carefully driven to hard pan or solid rock there might be serious undermining of the dam. The action of undermining varies according to the nature of the soil upon which it is built. If it is rock the chances are that the leakage will deteriorate the sheeting. If it is hard pan it will cut through it if the sheeting is not driven deep enough to overcome the pressure.

In gravel or loose soil it is imperative that the sheeting be driven deep enough so as to prevent all leakage, for a small leak will rapidly increase. If in clay, the sheeting driven into it for a moderate depth will very seldom give trouble. Concrete dams should always be on rock or hard pan and if on the latter an extra trench with a double row of sheet piling driven in it will prevent all leakage.

These leakage troubles do not always originate at the dam. Sometimes they are hundreds of feet back and are very hard to locate. If the water is reasonably clear and the pond not too deep, the easiest way to find these leaks is to use a boat to which are fastened ropes on each end and extending across the pond. Two men, one on each shore, move the boat back and forth, shifting position each time by 6 or 8 ft. up or down stream, as the case may be, so that the bottom may be carefully explored. In the boat a storage battery of the automobile type supplies energy to an automobile lamp which is fastened to a pole located inside a tin can so as to direct the light downward and keep it out of the eyes of the operator and enable him to observe the bottom. Care must be taken that the wires to the battery will easily detach themselves for there is danger of the boat being overturned if the light should be drawn into a suck hole suddenly. Sometimes these holes are of such magnitude that they can be observed by the whirlpool action on the water. Any exploring with lamps must be conducted after dark.

If the water is turbid and it is not possible to see very far, a metallic tube resembling a telescope, tapering from 2 to 6 or 8 in. in a length of 6 to 8 ft., tightly closed off at the bottom with plate glass, will enable observations to be made. To this tube the light can be fastened with the rays directed downward as before. It will be necessary to fasten lead or similar weight to the tube so as to make it sink to the proper depth. Great care must be observed so that the tube will not be caught in the suck hole, otherwise it will be gone in an instant.

Another way to explore the bottom is to proceed with a pole to which is fastened a can, the drawing action of which will locate the suck hole. After the suck hole is located, a few 2 by 4-in. timbers or poles can be placed in the shape of a tripod and the telescope attached and then placed over the hole for observation.

The hole being located and the size and nature thereof being determined, the next move is to plug it up. Sometimes throwing rocks in which will be carried down a distance and become lodged suffices. Some may pass through and come out below. A few corked bottles or sealed tin cans forced in above will often reveal the outlet below, after which bags of cinders, sand and stones may be thrown in the hole while someone observes the point of discharge to see if these bags are coming through. If they are not seen to come through it is assumed that they have lodged. It may be well to prove this by trying more cans or bottles and also looking for a decrease in the suction of the hole. If it is determined that the material is lodging, follow up quickly with more bags of cinders and stones until the suction is nearly gone. Then it is well to quickly fill with cinders and manure or just spout fine cinders in the hole. Care must be taken that about 2 ft. is left for a concrete top to seal this so as to avoid further trouble. The concrete should be one part cement to two parts sand, well mixed and slightly wet. This should be spouted into position through a pipe and be permitted to spread over twice as much area as that of the hole so as to be sure that everything is sealed.

Similar methods can also be used when the leak is at the dam proper. There are many leaks such as described which if repaired would result in the delivery of much more power. It is often advisable to engage an expert at hydraulic work to attend to work of this nature for he will usually save money in the long run.

MANHOLE LADDER PROTECTS CABLE SHEATHS.

Cleveland Electric Illuminating Co. Uses Ladders in Its Manholes.

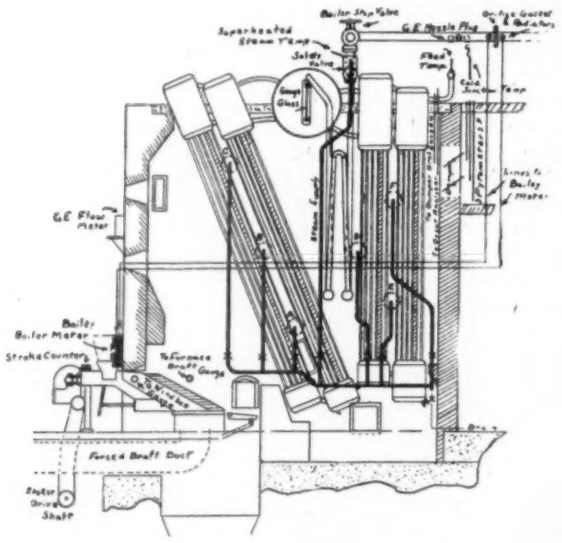
Damage is frequently done to underground cables where they pass through the manholes. This damage, which occurs to the lead sheath, is done by the men using the cables as steps to move in and out of the manholes and as they work in the manhole. Even when care is taken a cable sheath may easily be damaged irreparably by a nail in a man's shoe and similar causes.

The use of cement coverings, a sheath of steel

banding or asbestos cloth, are methods of protecting the comparatively soft lead cable sheaths, but even with these a careless or hasty man using the cables as steps may do damage. The Cleveland Electric Illuminating Co. is using a galvanized ladder in its manholes by which the men enter and leave the manholes. The company is finding these ladders worth while, since not only do they reduce the likelihood of cable trouble but lessen the chance of accident to the men and loss of time incident to climbing in and out of the manholes over the cables.

OPERATING RESULTS OBTAINED BY USE OF MECHANICAL SOOT BLOWERS.

The economies effected by the use of mechanical soot blowers, due to reduction in quantity of coal required, increased boiler efficiency and increased steaming capacity, have been generally recognized by engineers in recent years. Owing to inherent difficulties, however, there have been very few detailed tests made. The following list of mechanical soot blowers, thought to be the most accurate yet carried out, was made in



a boiler room comprising 14 Bigelow-Hornsby boilers of 625 b-hp. equipped with Diamond soot blowers and fired by Taylor stokers.

The boiler selected for the test consisted of ten groups or units of inclined tubes in the front over the furnace, and ten groups of vertical tubes in the back of these with vertical type Foster superheater in between. Each group or unit of tubes contains 21 3¼-in. steel tubes, a total of 420 tubes. All tubes fit into so-called unit drums. In each of these the ten top drums are connected to the main cross drum. The total heating surface of boiler is 7322 sq. ft. Manufacturer's rating is 625 b-hp. Steam pressure and safety valve setting are similar to that on the B. & W. boilers.

The stoker is of the Taylor seven retort underfeed type, having a grate area of 105 sq. ft. inclined grate. Forced draft was supplied to this stoker by a turbine-driven multivane double inlet fans. In this test the forced draft and stoker driver were separated and stoker was driven by one of the Westinghouse engines recently installed on the boiler room floor for the driving of stokers. Induced draft was obtained by means of fans located at the uptake to the stack.

The soot blowing equipment on this boiler consists of six elements located as shown in Fig. 2. The perforations in the elements A, C D, and F are arranged in five groups of four holes each on one side of the pipe, and five groups of two holes each on the opposite side of the pipe. The elements are set so that the issuing streams of live steam will play all along the tubes. Element B has a set of evenly spaced holes on one side only. This is essentially a baffle blowing element and the stop with which it is equipped prevents the hand wheel from being turned to a position where the jets will play directly on the baffle to the detriment of the latter. Superheated steam is used on this boiler, the supply being taken from the point in the boiler outlet just before the main valve.

The steam flow was obtained by means of two meters, one an integrating recording indicating General Electric meter, already installed and used in tests, the other a newly installed Bailey boiler meter. Weight of coal was obtained from the traveling weigh hoppers and lorry tickets. A revolution counter was placed on the Taylor stoker to count the revolutions of the main power shaft. The thermometer for obtaining superheated steam temperature and that for obtaining feed-water temperature were placed in thermometer wells in their respective pipes at the top of the boiler as in previous tests. The uptake temperature was obtained from three pyrometers inserted into the flue above the damper and inserted at 4, 5 or 6 ft., respectively. The cold junction temperature was obtained by means of an indicating thermometer suspended over the cold junction of the pyrometers, steam pressure was obtained from the steam gauge in regular service on the drum. A steam correcting thermometer for obtaining the superheated steam temperature corrected. The carbon dioxide of flue gas was obtained by means of a sampling tube already installed and used in previous tests in conjunction with a standard Orsat gas analyzer. Draft over the furnace and at the damper was obtained on the indicated gauge. Pressure in the wind box was indicated on the lower gauge and on the recording pressure gauge. In addition to the above, the Bailey meter indicated the draft over the furnace and the air flow through the boiler, the latter being obtained by means of two 1½-in. pipe connections, one to the combustion chamber over the furnace and the other in front of the damper at the same height as the first. The various items indicated above and constituting the testing apparatus on this boiler, are shown in the accompanying sketch.

The test began at 5 a. m., Feb. 3, 1919. The duration of each run was 24 hours. At the beginning of each run the fire was cleaned and the hopper filled. The tail gate was cleaned whenever found necessary by observation of the fire. This varied from about every 2 to 4 hours, depending on the load.

The method was to run a series of tests with the soot blowers attempting to grade the runs from 75% load to about 200% load, each run to extend for 24 hours. This was to be followed immediately without operating the soot blowers, duplicating the loads and conditions of the first series as closely as possible.

The fire-room crew were guided by the steam-flow meter in maintaining the load and also by regulating the opening at the dampers on other boilers. During the test, with soot blowers, the latter were operated every 6 hours. The operation consisted of turning on the steam in the supply header, then in turning on the steam in each element and by means of the chain around the hand wheel turning the element three

times in both directions as far as possible. This operation for the boiler occupied 10 and 15 minutes.

On this boiler eight runs in all were made, the first four being with soot blowers and the second four being without soot blowers, attempting to reproduce the conditions of the first four as nearly as possible. In doing this the fire-room crew and the tester were guided by the average conditions attained in the first four runs. Readings were taken every 20 minutes.

The steam utilized by the soot blowers was not registered by the steam flow meters, owing to the fact that the meter connections to the boiler are placed at a point which is not passed by the steam used in the soot blowers. The steam was used along the inside walls and bridgewall to decrease the accumulation and adhesion of clinker. This is a connection in operation during regular operation, and was less so during the test. This steam, also, was not taken into account by the steam flow meter. Readings were taken as follows: Steam flow; air flow; furnace draft gauge; windbox pressure; the speed of the stoker line shaft; the number of revolutions of the stoker power shaft; steam temperature; feed water temperature; flue gas temperature on three pyrometers; cold junction temperature; air temperature; steam pressure, and carbon dioxide in the flue gas. Forced draft was obtained from a blower which was isolated from the other blowers by closing the division damper. It was kept running throughout the entire test, and the draft on the boiler was regulated by means of the control at the boiler.

It has been stated previously that with the present practice of cleaning the boilers with the hand lance, each boiler is cleaned every four or five days. In the tests without soot blowers, in order to reduce this condition, the series was started with the boiler heating surface clean and then left without any cleaning during the series. If the series had been extended for, say, an equal period or longer, and if during that time the regular hand method had been used to clean the boilers on the regular schedule, it is very probable that a still greater rise in flue gas temperature and still greater decrease in combined efficiency would have resulted. This statement is made because it is believed that with the present hand method, owing to the fact that all soot is not removed, there is a gradual accumulation on the heating surface, the longer the boiler remains in service. Therefore, based on the above, it is safe to say that the results obtained were conservative, that a more exact test along the line indicated would show better results.

In addition to the above, may be mentioned the fact that operation of the soot blowers does not require the banking or shutting down of the boiler, while in order to remove the soot by hand method it is necessary to shut down the boiler for two or three hours, during which time the boiler setting cools and must be warmed up again. Here is a loss which is eliminated by the use of soot blowers.

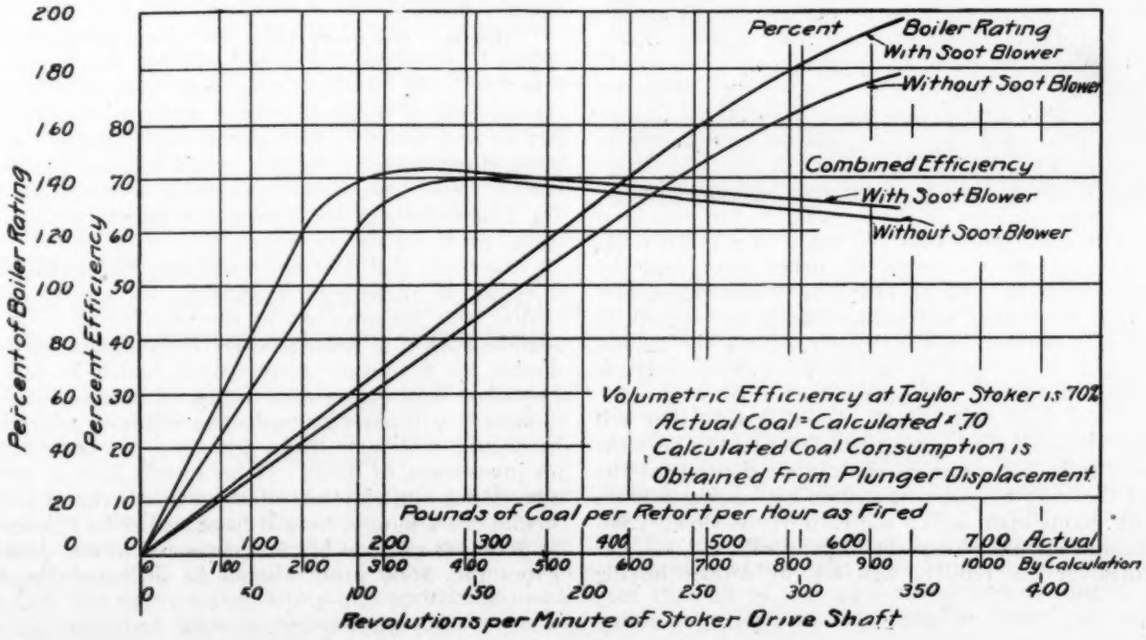
It has been stated that the steam used by the soot blowers was not included in computing boiler efficiency. In other words the boiler was charged with this steam. On the other hand since no steam was used in the tests without soot blowers, the boiler was not charged with steam for this purpose, but it is equivalent that in a long series, as in actual practice, considerable steam would be used for cleaning by hand lance, which would have to be charged to the boiler, therefore further decreasing the combined efficiency.

In conclusion it should be noted that these tests were conducted in a manner calculated to indicate a minimum rather than a maximum improvement by the use of soot blowers. It would have been fairer, on the whole, perhaps, to have refrained from using the soot blowers at all before making the tests without soot blowers, using the hand lance only to clean the boilers at the regular periods of cleaning. Had this been done, the boilers would not have had the advantage of being thoroughly cleaned by mechanical blowers when they entered the hand hose test.

COMPARISON OF COMPOSITE RESULTS WITH AND WITHOUT DIAMOND SOOT BLOWERS.

Decrease in average uptake temperature with soot blowers	36.1%
Percentage gain in efficiency of boiler, furnace and grate with soot blowers	2.05%
Value of savings of coal per year based on 1918 consumption and prices	$8,559.86

The accompanying table contains a summary of the benefits, exclusive of decreased labor and labor turn-over, of using the soot blowers. It shows that even under the conditions given, the soot blowers would pay for themselves in a comparatively short time.



Contractor-Dealer

How Turnover Effects Profits — Clever Schemes Used to Attract Summer Trade — Dealer's Relations to the Public

THE EFFECTS OF TURNOVER ON PROFITS.

A Discussion of This Important Factor in Merchandising and Methods of Figuring.

By Chester A. Gauss.

Everyone knows that a high rate of turnover is desirable but the reason is often obscure. In fact, the difference between a quick turnover and a slow turnover often amounts to the difference between success and failure.

Turnover may be said to be the time that elapses between the time an article is paid for and the time it is turned over into money again. It is hence, the length of time money is invested in any given lot of merchandise. A good paying business can be built upon small profits just as well as upon large profits. It all depends upon the rate of turnover. Some United Cigar Stores have turned over their stock as often as fifty times a year. A net profit of 1% at such a turnover rate would give a profit of 50% on the capital invested at the end of the year. If the turnover were only 25 times a year and the net profit 1% on sales, the profit for the year on the capital invested would be 25%. To realize the same profit on this turnover as on a turnover 50 times a year, the net profit per sale would have to be increased to 2%.

It is not likely that any electrical contractor or dealer can realize such rapid turnovers but the same principle holds. If a contractor-dealer buys an appliance for $5 and sells it for $15 at the end of the year he has made 200% gross profit on his investment. If he buys $5 worth of electric lamps per month and sells this amount of lamps each month for $7.50, he realizes a gross profit of 50% per month on his investment. This amounts to 50 times 12 or 600% profit for the year on the investment. In other words at these turnovers $5 invested in the appliance first referred to gives a gross profit of $10 at the end of the year while $5 invested in lamps gives a gross profit of $30 at the end of the year.

The profit in any business is, therefore, in the sale of goods and not in the keeping of the merchandise. The more sales that are made in a given time, the more rapidly the stock is turned over and the greater the profit. If an electrical contractor-dealer finds that he cannot sell certain stock at a profit, it is better to sell it at a loss, thus releasing the capital invested in it so that it can be reinvested in stock that will sell quickly and earn money for him.

For the man with small capital, goods that sell quickly should be bought in preference to the slow sellers. It is far easier to show a good profit at the end of the year by doing this than by loading a store up with goods upon which the turnover is slow. Limited capital should always be kept working.

Turnover can only be bettered by proper buying or the increasing of sales. Goods cannot be bought properly unless some record is kept of the sales of each article. To obtain this information, of course, involves a little labor but, since it enables the merchant to sell the same volume on a smaller capital investment, it pays.

One of the easiest ways to obtain data on turnover is to maintain a card index with cards for each article carried. On these cards should be entered the date and quantity of an order of goods when received, as well as the quantity still on hand at that time. When the stock on hand of any item becomes low the merchant can easily count the amount on hand and by referring to the card determine the rate of turnover on the last lot—that is, how long it took to dispose of it. This will enable him to determine the best quantity to order.

When ordering, discounts play as important a part in determining the quantity as does turnover. Suppose that by buying lamps in 100 lots no discount will be obtained and the stock turned over in a month, while if 500 lamps are bought a 10% discount will be obtained. On the basis mentioned, it would take five months to turn over this stock of 500 lamps. If the net profit per lamp is 20% of the cost price when bought in 100 lots, the profit at the end of the year on the money invested will be 12 times 20 or 240%. If the lamps are bought 500 at a time and sold at the same price 10% additional profit will be made on the cost price or a total of 30%. But the 500 lot stock can only be turned over in 5 months or 2 2/5 times a year. The profit for the year on the money invested will be 30 times 2 2/5 or 72%, compared with 240% profit on the invested capital if the lamps are bought in 100 lots. It would, hence, pay the electrical contractor-dealer who is limited in capital to buy in the smaller quantity.

Suppose, however, that the electrical contractor dealer is not limited in capital and that 100 lamps cost him $25. On this basis 500 lamps cost him $112.50. At the end of the year he will make 240% profit on $25 or $60, which is 72% profit, while on $112.50 the gross profit amounts to $81. Since this electrical contractor dealer has unlimited capital it would be well for him to buy in 500 lots and obtain this $21 additional profit on his investment.

Overhead and turnover are closely related although it is not an infrequent occurrence for one to fail to realize the importance of the connection. If, by spending $100 a year in advertising a merchant can double his turnover on an article which he buys in $100 lots and turns over for $150 once every two months it will pay him to do so. Without advertising he would realize 6 times $50 or $300 per year on an investment of $100. If he spends $100 a year in advertising and is thus able to turn over this $100 stock once a month, he will have realized 12 times $50 or $600 per year on his $100 invested in merchandise. From this $600 profit should be deducted the $100

spent for advertising, leaving a net profit of $500 on the investment in place of $300 as would be the case if no advertising were done.

Similarly, if a $20 a week clerk can sell one washer costing $75 and selling at $125 a month while a $25 a week clerk can sell two washers per month, it will pay to fire the $20 a week clerk and hire a $25 a week clerk provided, of course, he is as efficient or more efficient than the cheaper clerk in selling other appliances. Considering four weeks to a month, the higher priced clerk costs only $20 more but in place of selling one washer at $50 profit he has sold two which give a profit of $100.

In figuring turnover one must also take into consideration the effect of any increase or decrease in his turnover upon his overhead expense. If doubling the rate of turnover means that double the sales can be made at the same overhead expense, all the advantages of doubling represent clear profit. If, however, doubling the turnover adds to the overhead expense, this increased overhead must be figured in when determining the desirability of the increased turnover.

Another factor that is too often overlooked in connection with turnover is collections. An article is really not turned over until the selling price is actually paid by a customer. If collections are difficult and if credit, where granted, must be long time credit, it may pay the electrical contractor dealer to sacrifice this credit trade because it takes so long to realize on his investment that, if the same amount were invested in other goods and a strict cash business done, the amount realized at the end of the year may be greater.

Prices and turnover also are closely connected. One can more easily afford to make a small profit on goods that turn over rapidly than to make a small profit on goods that turn over slowly. A profit of 1% on an investment that turns over 12 times a year amounts to the same at the end of the year as 12% on the same amount invested in articles that turn over only once a year.

From this, one can readily see that if a merchant can make his turnover more rapid by sacrificing a little net profit on each sale it may be possible to make more money on the same investment at the end of the year. If an article costing 20 cents is sold at 30 cents, and the stock of 250 worth $50 is turned over once every two months, the gross profit at the end of the year neglecting overhead is 250 times 10 cents times 6 to $150. If sold at 28 cents and turned over once a month the gross profit at the end of the year will be 250 times 8 times 12 or $240 on the investment.

These are but a few factors that affect the profits at the end of the year. Every innovation and every change made in methods, policies, buying, etc., must be viewed from many angles—overhead, net profit per sale, turnover, etc., in order to determine its effect upon the profits on the capital invested.

FEATURING ELECTRICAL HOUSEHOLD SUPPLIES DURING SUMMER WEATHER.

Several Clever Schemes Used by Successful Merchants to Attract Summer Trade.

By W. B. Stoddard.

Although the hot summer weather is nearly over there will still be many days when the thought of cooking becomes a nightmare to the majority of housewives. This is the time to impress upon them the fact that many crisp, dainty and appetizing meals can be prepared without heating up the house by using electricity and electric cooking utensils. E. L. Knight & Co., Portland, Ore., instituted a regular campaign along this line by means of catchy cards in the papers, such as:

What Shall We Have for Breakfast?

Coffee, and toast, and a poached egg, with a dish of fruit. Save time and temper, and serve them in a cool room.

It's regular fun to get breakfast with an Electric Toaster, Percolator and Hot Water Heater. No need to go into the kitchen at all—make them and serve them at the dining room table.

Another advertisement laid stress on the convenience for mid-day or after-theater lunch:

A Tasty Little Midnight Feast.

Whether the weather is hot or cold, a cup of tea, chocolate or coffee is the best thing for that "tired feeling" that is the result of a strenuous day's activity. Crisp toast, too, to go with the salad for a noon-day lunch is always acceptable.

But who wants to make a hot fire to secure these little luxuries? No need to heat the room or yourself. Use an Electric Percolator, Toaster or Grill, and earn the enthusiastic praise of your luncheon companions.

The window that supplemented these cards attracted instant attention. Three tall stands were draped with folds of velvet, and on top of each was an electric percolator. Two lower stands held chafing dishes, and down in front was a waffle-iron with three or four crisp, brown waffles. A large oval card advised: "The Modern Way—the Electric Way." When the idea of a more general use for electric appliances had been thoroughly spread, they sent out to a selected list of patrons a card of invitation:

"You are cordially invited to attend our afternoon tea, Saturday afternoon, from 2 to 5, and learn what delicious lunches can be prepared on electric appliances. Come and enjoy a cup of tea."

An Attractive Window Display of Electric Cooking Appliances.

A little rustic summer house was fitted up at one side of the store and in this sat a young woman before a tea table, on which was a large electric percolator, toaster and grill. Upon these she made coffee, tea, toast and a dressing for the toast. This was served by a maid to all callers, wicker chairs and small tables being disposed about the salesroom so that all could enjoy the lunch at their leisure. "We found," said the manager, "that by putting our guests thoroughly at their ease the best results were secured. By having them seated, too, their gaze had a chance to wander around the store, and, as we took pains to see that all of our appliances were arranged in the most attractive manner possible, many conveniences

were seen that caught their fancy. We were not too high-brow to refrain from tagging each piece of merchandise, though in an inconspicuous manner of course, and the result was that they had a chance to learn the price without consulting any of the sales

A Fan Display That Suggests Cooling Breezes.

force, which many seem afraid to do." Little wicker tables were distributed about the room, each with a table lamp with wicker, silk-lined shade, and a vase of flowers. These were set with fragile china and the appropriate electrical appliances, and each table bore an appropriate card.

For the benefit of many, especially men who stopped to look at the window without going inside, there was a small metal wall pocket attached to the bricks at the side of the window, which had printed above it: "Take One of Each." In this pocket, which was divided into compartments, were little booklets on mazda lamps, household appliances, washing machines and house wiring.

The hot weather was long in coming this summer but when it came it set upon us with a vengeance, and the thoughts of all were turning to the best way of keeping cool. Electric fans were brought out and every wideawake dealer featured them in his best manner. One of the best displays along this line was that of The Lighthouse, Inc., Seattle, Wash. The walls were of buff, with panels of dark green, to which were fastened bulbs, sockets, cord and other accessories of electric illumination. A long low bench was covered with cotton wadding to represent snow, and on it was placed an electric fan, the wheel being covered with strips of cardboard of gay hues, which, when the fan revolved, gave it the appearance of an animated rainbow. The floor was also covered with cotton, amid which was an electric fan at rest, so that one could observe its construction.

But it is not only in the drawing room and dining room that electricity comes to one's aid. The laundry will benefit immensely by its use, and especially in the rural districts, where the housewife is usually the laundress as well. The electric washer will prevent many a nervous breakdown. H. R. Basford, San Francisco, brought this fact pertinently before the public through his publicity campaign.

In the window was a scene that showed the contrast very strongly. At one side was the figure of a woman in water-splashed dress and apron, bending over a tub, set on the back of a chair, and at the other an electric washing machine, and near it, in a wicker chair, reading a paper, another woman in neat blue dress. Cards at the base of either figure said: "The Old Way' and "The New Way." Across the base of the window extended a long sign: "Buy an Electric Washing Machine and turn Blue Monday into Sunny Monday." His newspaper advertisement read:

STOP! MR. MAN!

You don't cut wheat with a scythe. You don't write with a quill. You don't read by a tallow candle.

WHY DO YOU EXPECT YOUR WIFE TO USE THE OLD-FASHIONED WASH TUB?

Bring the good wife down to our store and let us demonstrate the Electric Washing Machine. A week's wash done in an hour.

Sold on easy terms if you desire. Pays for itself in a year's time in saving on wear of clothes and laundress' time.

During the recent Home Coming Week celebration they created much amusement, but at the same time drove home very effectively the point they wished to make. During this festival a float was arranged on one end of which was a man, enveloped in a big apron, laboriously scrubbing clothes, while at the other his little daughter was superintending the washing of clothes in an electric washing machine. A big sign on either side of the float observed: "If Father had to do the washing you'd see an Electric Washing Machine in every home inside of a month. Be a good sport and get one for the good wife. Sold on easy terms if desired. Come in and see them demonstrated."

DEALER'S RELATION TO THE PUBLIC IN MERCHANDISING.

Paper Read Before National Association of Electric Contractors and Dealers at Recent Convention.

BY J. R. TOMLINSON

Pierce-Tomlinson Electric Co., Portland, Ore.

The relations of the dealer to the public in merchandising consists of two distinct fundamental factors that must be analyzed and studied separately to determine whether the electrical retail store in its present relation to the public is to continue and develop along lines now existing and the proposed development thereof, or whether it is to change its course into some other channel.

The first of these factors is,—does the present retailer stand on logical, economic ground as a constituent part of the machinery by which electrical goods are to be distributed to the general public? From a theoretical viewpoint the retailer as we know him at present, is surely the proper agency through which the manufacturers' product should flow to reach the consumer, but whether or not he will be so recognized in the future depends upon how he develops as a business man. Now that the world has again resumed something like a normal attitude, manufacturers are turning their thoughts and energies to supplying the needs of the people that will contribute to their comfort and pleasure instead of their destruction and the dealer must, to be recognized as the logical distributor of such goods, be able to convince the manufacturers that he can furnish the business vehicle for such service. Competition is going to be very keen and the manufacturer will seek the outlet through which he can distribute the greatest quantity of his product, therefore it will be incumbent upon the dealer to convince the manufacturer that he is equipped in every essential detail, such as adequate finance, energetic sales policy, efficient delivery service and a liberal repair service. This is the first fundamental to be

established. Having satisfied the manufacturer as to the tenability of his position, the second fundamental must be considered—contact with the public.

From the standpoint of economy, is a line of electrical specialty stores prepared to dispense strictly electrical apparatus and supplies, justifiable or shall this business be absorbed by other merchants? Again, due to the fact that the business is of a highly technical nature, it is evident that the public would be much more efficiently and satisfactorily served if a sufficient number of electrical specialty stores judiciously distributed and wisely operated, were to be established.

In any discussion of the relationship of the dealer to the public it would seem that the first consideration should be a clear understanding of just what constitutes the dealer. According to Webster, "The dealer is one who deals in any sense—a trader." However, the more modern classification of dealer in the term "Merchandiser" is preferable. According to Webster, the merchandiser is a person who buys and sells commodities as a business for profit. This distinction is made because it can readily be appreciated that we have too many "dealers" in this country and not enough "merchandisers."

Men and women of this country take the store and the merchandiser too much as a matter of fact, just as they take electric service with scarcely a thought of its wonders and its possibilities. After the house in which he lives, nothing is more important to man in the economy of life than the store from which he draws those things upon which he lives.

Thus the storekeeper or the merchandiser, is one of the greatest factors in the economy of life. Upon his efficiency depends the economical distribution of nearly everything that man produces. He is not alone the most important link in the chain of distribution that reaches from producer to consumer,—he is, practically the whole chain.

In improving the efficiency of the storekeeper, therefore, one serves the manufacturer and other producers by stimulating the consumption of their commodities. And, in like manner, the general public is served by every improvement in service and economical distribution. A merchandiser who loafs on his job not only limits his own livelihood but is an encumbrance to the prosperity of his fellow men.

In order to justify his existence as such, the electrical specialty merchandiser must, in addition to being competent to give expert information to his customer on ordinary, every-day electrical problems, be a competent business executive. All these accomplishments are not essentially to be centered in the one individual where the establishment is large, but in the smaller cities where the proprietor personally supervises the detailed affairs of his business he must necessarily, to be successful, be both executive and experienced mechanic. For this reason some plan should be devised whereby the electrical dealer of the future may receive his preliminary instruction in th art of merchandising. A large percentage of the present dealers are men who have stepped into the business from the ranks of the mechanics without having had any previous preparation for executive or merchandising service. The results of this are well known. This situation should be rectified for the good of the vocation and the public. To establish the fact that he occupies a sound economic position, the dealer must keep absolutely abreast of the times in the realm of merchandising.

In going deeper into the relations of the merchandiser to the public, there is one very important factor to consider, that is the element of human nature. Human nature is largely the same the country over. The desire to possess necessaries and luxuries exists in every man, woman and child. Therefore, whether the merchandiser be located in a large city, or a small town, the first milestone on the road to success is a study of human nature, particularly of the buying characteristics of your community.

Truth in advertising should be an unwavering principle, and advertising matter, systematically placed, should always be clearly and unmistakably worded so that the reader may have no cause to misconstrue the meaning.

The store arrangement and display should be orderly and tidy, the quality of the furnishings depending largely upon the class of trade that is catered to, and the general character of the surroundings, but always neat and clean. Show windows should be washed frequently and the window display should be changed at least every two weeks. If the many excellent and timely suggestions that are received by all dealers through the mails almost daily from the various manufacturers, and trade papers, are preserved for use at appropriate seasons, there would be no excuse for paucity of window-dressing ideas.

Neat tags, bearing retail prices in plain figures, should be appended to each article for sale. This gives the customer a feeling of confidence that he is dealing with a one-price concern.

The sales force should be neatly attired, courteous and accommodating. Most customers have absolutely no knowledge of electrical terms or their meaning, and the manner in which the salesman imparts a little helpful information to such customers usually determines whether or not he has made a future patron. If the information desired is given in a friendly, helpful spirit—well and good, but if with a lordly, smarter-than-thou air—good-bye customer. In fact, in all departments of his business through which he comes in contact with the public, such as his accounting and collections, delivery and repair service, good judgment must be exercised if the best results are to be obtained.

A liberal repair service to remedy or repair defective goods is a good policy. Occasionally, some one will take advantage of such liberality, but in the long run it pays.

One excellent opportunity for widening his clientele is quite generally overlooked by the electrical dealer. That is through membership and active participation in the activities of his local chamber of commerce, or other civic organizations. Most people are appreciative of unselfish efforts that are made in behalf of their home town and if the dealer does his fair share of community work he will find in addition to the personal satisfaction arising from having performed some real duties of our citizenship that there will come a response from his neighbors and townspeople in the form of increased business that will be a surprise to him. In addition, all transactions, whether private or public, should be so conducted as to inspire in the public mind a feeling of absolute confidence and trust.

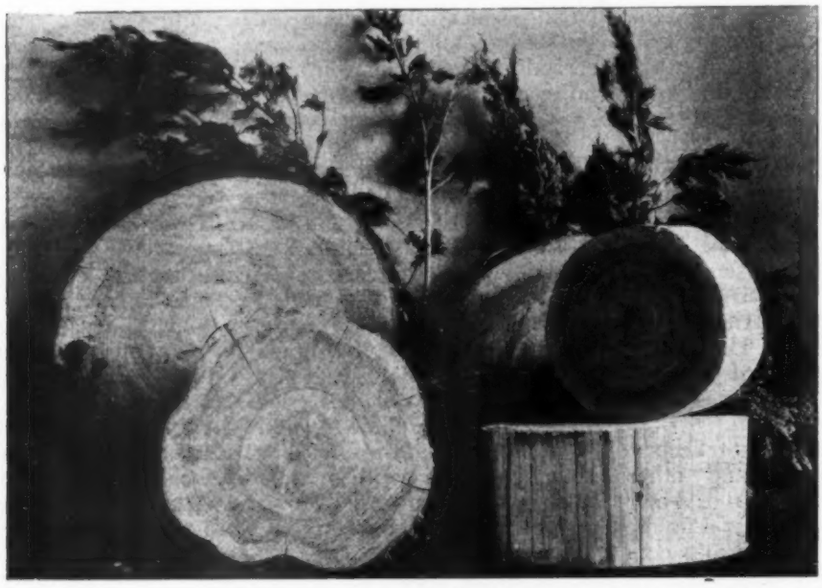
In conclusion, the measure of the merchant's success will depend upon his ability to qualify on the foregoing necessary conditions, and if he puts industry behind it all he need have no fear for the public's hearty support. In fact, no opportunity exists in the retail line today that seems so favorable for men of the right qualifications.

New Appliances

Southern White Cedar for Poles—Special Radio Apparatus for Experimenters — Single-Stage Centrifugal Pumps

Southern White Cedar for Overhead Line Poles.

Cedar has for a great many years been a favored timber for poles of electric light, power, telephone and telegraph companies, the reasons for its choice being its well-known properties of long life, strength and reliability of service. Among the cedars is a species that has not yet been generally employed to any great extent except in certain sections of the country. It is southern white cedar. A Forestry Service bulletin states it is valuable "on account of its long life when in contact with the ground." There are instances of southern white cedar poles having been set for 20 years and still remaining in serviceable condition. One of these lines is at Marion, Ohio.



Several Typical Cross Sections of Southern White Cedar, Showing Good Structure for Pole Purposes.

An experienced timber producer not long ago became a convert to the suitability of southern white cedar for pole purposes and has actively taken up its production and sale for this and other purposes. Willis H. Gilbert, Fisher building, Chicago, has taken over the business of handling "Dixie" brand white cedar. He has had an extended experience in the lumber business since 1880, when he operated pine and hardwood mills at Bay City, Mich. In 1896 he took over some mills at Ashland, Wis., and a few years later also at Washburn, Wis., and Duluth, Minn., producing Norway pine. He became a specialist in this timber and made an enviable reputation for the splendid stock he cut. All timber was produced in his own camps and especially selected to suit requirements as to size, etc.

This practice is being followed by Mr. Gilbert in the southern white cedar business. He produces the timber in his own camps, has it specially selected for the service it is to render, and carefully inspected before shipment. As the result of this practice Mr. Gilbert has not had a single pole rejected this year. The accompanying illustration shows typical sections of southern white cedar, and also some characteristic boughs that Mr. Gilbert had prepared to show the excellent structure of this timber.

Thordarson Apparatus for Amateur Radio Work.

To meet the needs of wireless experimenters who wish to make use of vacuum-tube equipment, the Thordarson Electric Manufacturing Co., 501-515 South Jefferson street, Chicago, has placed on the market special apparatus which is illustrated in the accompanying group cut.

Fig. 1 shows the new Thordarson wireless transformer, whose rating is 1 kilovolt-ampere and 25,000 volts. It is an air-cooled radio transformer of the closed-core, double magnetic circuit type. One of the magnetic circuits is variable to give wide regulation of voltage, capacity and reactance.

The core is made of high-grade silicon steel with laminations 8 mils thick.

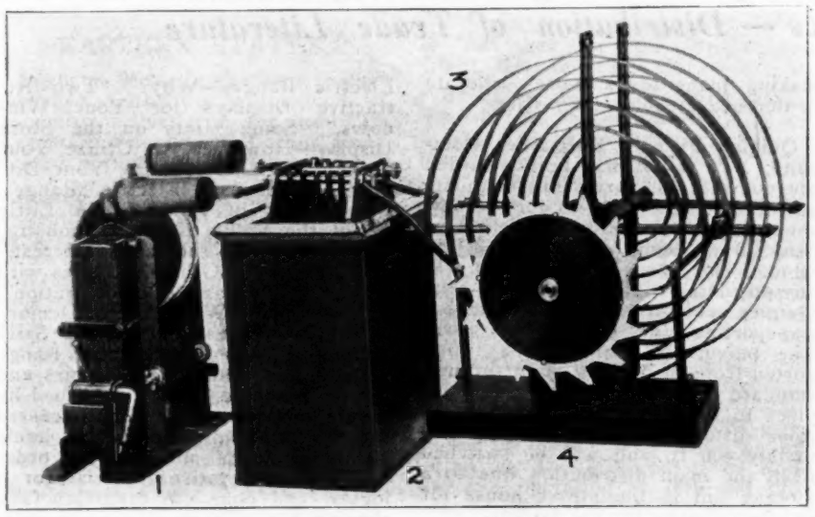
The essential feature of this unit is its magnetic shunt and control which protects the transformer from undue current surges, such as are frequently present. These transformers can be connected directly to the alternating-current source without requiring a choke coil or other impedance. The construction of this transformer includes elimination of all castings, springs and adjustable screws, pressed sheet steel and brass clamps being used in place thereof. Regulation is accomplished by a simple system of levers and accentric cams, which are quiet in operation at all positions. A special mechanical and corona shield for the high-tension coils and a grounding terminal are provided. The coils receive a vacuum impregnating treatment and a special folded layer insulation is used for the high-tension coils. The transformer is entirely oil-proof and waterproof. It is very neatly assembled and makes an attractive unit in the radio set. Exceptionally high efficiency is claimed for this transformer.

In Fig. 2 is shown the special condenser for this equipment, the dielectric of which is phenol fiber, which has withstood potential tests at 48,000 volts before breaking down. It thus permits of an overload of nearly 100% when used with the Type R. 25,000-volt transformer shown in Fig. 1. The edges of the sheet brass are rolled and the corners rounded, thereby preventing a loss of energy by corona or brush discharge. Between each two sheets of brass on each terminal of the condenser is inserted a third sheet which is corrugated. This arrangement permits the oil to penetrate and circulate, and at the same time prevents heating. There is practically no loss of energy due to heating, corona, or brush discharge, and therefore extremely high efficiency is attained. After assembling, the condenser is immersed in a container of oil, as it is a well-known fact that the greater number of long-distance amateurs use an oil-immersed condenser.

The outstanding feature of this condenser is the arrangement of the 10 terminals. The capacity can be increased from a minimum of 0.0018 mf. to a maximum of 0.009 mf. in single steps of 0.0009 mf. each. This permits very fine adjustment in the closed secondary circuit, and the number of turns on the primary of the oscillation transformer can be increased or decreased by merely decreasing or increasing the capacity of the condenser.

The oscillation transformer is shown in Fig. 3. The primary of this transformer consists of 3¾ turns of 1-in. heavy copper ribbon supported in fiber strips. The secondary consists of 7¾ turns mounted in the same way as the primary. The primary inductance is approximately 4.5 microhenries. When the maximum turns

on the primary are used with the condenser having a capacity of 0.009 mf., the wave meter shows a reading of 385 meters. Using one complete outside turn or an inductance of about 1.2 microhenries and a condenser capacity of 0.009 mf., the wave meter shows a reading of 205 meters. The secondary inductance is approximately 10.9 microhenries. When using a condenser capacity of 0.004 mf. to 0.009 mf., a very select range of short wave lengths can be attained.



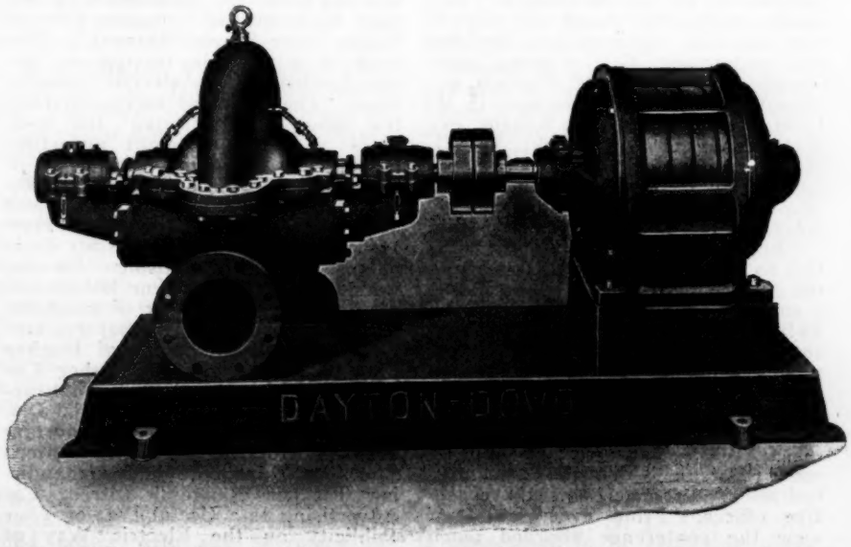
Figs. 1 to 4.—Thordarson Radio Transformer, Condenser, Oscillation Transformer and Rotor for Spark Gap.

Fig. 4 shows a rotor for the rotary spark gap where the latter is to be used. The rotor of electrodes is of ⅛-in. hard aluminum, 8 in. in diameter. The center disk is phenol fiber. Actual test with the rotor of 16 teeth on a motor driven at 1000 r.p.m. to 1500 r.p.m. produces a low note with carrying quality. The same tone was produced with the rotor of 8 teeth and motor driven at 2000 r.p.m. to 3000 r.p.m. The tone can be varied by regulating the speed of the motor, but it is the low note that makes amateurs heard at long distance.

Dayton-Dowd Motor-Driven Single-Stage Centrifugal Pumps.

The simplicity of centrifugal pumps and their reliability in operation has won them so much favor that they are coming steadily into more and more extensive use, especially where motor or turbine drive is to be used. A large number of makes of centrifugal pumps are now on the market, and among these is a line that has been developed after many years of experience and has been employed in a great many installations, among the more notable ones being the Hog Island shipyards near Philadelphia, where six 8-in. pumps of this type are used; another case is in the water supply for the Great Lakes Naval Training Station which uses a 10-in. pump.

The pumps referred to are made by the Dayton-Dowd Co., Quincy, Ill. They are known as type CS single-stage double-suction volute centrifugal pumps and are made for either direct connection through an electric motor, steel turbine, oil or other engine, or for being driven by a belt. These pumps are built with special care for ruggedness and simplicity of construction and have excellent efficiency in operating characteristics. The main casing consists of two parts of which the upper half forms a cover and the lower half, with which are cast integral suction and discharge openings, and the feet. The upper half is provided with water seals, vents and an eyebolt for lifting; the lower half is provided with proper drains to permit draining the casing entirely when necessary. Between the two halves is the only joint in the casing; this is provided with a special manila paper gasket that sets between two specially machined surfaces, thus giving a perfectly water tight joint when the heavy flanges are securely bolted together. Although usually made of cast iron, under special conditions the case is furnished of bronze, brass or other material. Special bearings are provided outside of the pump casing so that any water leaking from the stuffing boxes will not enter the bearings or oil reservoir. All bearings are provided with oil rings to lubricate them thoroughly. Special care has been taken in the design and in the finish of the impeller. A special system is used for checking and polishing the interior of the impeller so that it coincides absolutely with the designs. In larger sizes a separate bronze wearing ring is shrunk in place on the impeller hub. There are also provided bronze case-wearing rings of wide section and machined to give a minimum running clearance with the impeller rings, so as to insure against leakage. The stuffing boxes are arranged for five or six rings of packing and a bronze water-seal ring. All of the pumps are provided with a flexible coupling of the pin and rubber bushing type, thus allowing a slight misalignment. In the case of belt-driven pumps an outboard bearing is provided, and in the larger sizes an additional bearing is provided beyond this to release the pump-bearing of the strain from a heavily loaded belt. These pumps are made in sizes from 1¼ in. up to 30 in. and with normal capacities of 30 to 26,000 gal. per min. Each size is made in various speeds and for various heads. Each pump is thoroughly tested to be sure it meets all of the conditions for which it is to be used.



Dayton-Dowd Motor-Driven 8-Inch, Single-Stage, Double-Suction Centrifugal Pump.

Remarkable Success of Australian-Made Wireless Apparatus.

The wireless operator in the steamer *Karbola* has reported that when his ship was off the northwest coast of Australia he received clear messages from an English low power station in the North Sea which were transmitted on the ordinary short wave-length of 600 meters.

This feat was achieved with the new Expanse type magnifying valve receiver designed and manufactured in Sydney, Australia, by Amalgamated Wireless (Australasia) Limited. These receivers include a modified Fleming valve and were originally designed by the company's managing director, E. T. Fish, for demonstrating the possibility of receiving messages in Australia direct from the Marconi station at Carnarvon in Wales, nearly 12,000 miles away, or practically half way around the globe.

Trade Activities

Large Power Plant for Pittsburgh — Successful Roller-Smith Conference — Distribution of Trade Literature

The C. H. E. Williams Co., electrical engineer and contractor, Seattle, Wash., and Vancouver, B. C., installed the electrical equipment in use in the new plant of the Kilbourne & Clark Manufacturing Co., in Seattle, which was described and illustrated in the ELECTRICAL REVIEW of July 19, 1919.

Dwight P. Robinson & Co., Inc., 61 Broadway, New York, has been awarded a contract by the Duquesne Lighting Co. of Pittsburgh, to design and construct a power station at Cheswick, near Pittsburgh, to have an ultimate capacity of 300,000 kw. of which one unit of 60,000 is to be installed initially. The work consists of a new power-station building with the necessary complement of boilers, piping, electrical apparatus, coal handling devices, coal storage, etc. It is anticipated that the work of installing the first unit will require about 12 months.

Wheeler Condenser and Engineering Co., Carteret, N. J., has issued a very clever and interesting little booklet entitled "What Worried Admiral Jellicoe Most." This little publication takes up extracts from Admiral Jellicoe's story of the grand fleet that deal with the big 11-in. guns and condenser tubes. The theme of the booklet is the importance of condenser tubes in a navy, the amount of anxiety caused the British admiral by condenser tube trouble, and the facilities at the disposal of the Wheeler Condenser and Engineering Co. for supplying condenser tubes and research. Tables of condenser tubes weights for tubes of copper and brass are included.

Roller-Smith Company, 233 Broadway, New York City, held a sales conference at its Bethlehem, Pa., works during the week of July 7. The following representatives attended this conference: G. L. Crosby, sales manager, New York; M. Frankel, assistant sales manager, Chicago; C. M. Hunt, New York; C. G. Kahant, export manager, New York; W. G. Merowit, Buffalo; C. H. Nicholson, Detroit; F. C. Perkins, Philadelphia; W. G. Pieksen, St. Louis; F. W. Ryan, Chicago; W. J. Shire, New York; J. E. Wood, Cleveland. In addition to the discussion of sales matters the social side of the conference was a source of much pleasure to all the Roller-Smith men. I. E. Hall, assistant works manager, and W. H. Pugh, superintendent, entertained the men at several functions during the conference. The conference ended in the Roller-Smith Company's New York office at 233 Broadway on July 10, subsequent to which the men who had attended returned to their respective offices. From every point of view the conference afforded much benefit as well as pleasure and the Roller-Smith Company is already making plans for a more elaborate conference at some later date.

Quigley Furnace Specialties Company, New York, has been awarded the contract for furnishing complete powdered-coal equipment for the new sheet mill of the Falcon Steel Company, now being erected at Niles, Ohio. The power-plant boilers will be powdered-coal fired, using the Quigley compressed-air system for transporting and burning the coal. The pulverized coal will be transported from the milling plant through standard 4-inch diameter wrought pipes to furnaces and boilers for various distances aggregating approximately 800 ft. and will be switched from the main distribution line to a storage bin in the power house for use as required for the boilers.

Karry-Lode Industrial Truck Co., Inc., Long Island City, New York, has now available for those interested specification sheets for their models No. 1 and No. 2 storage battery tractors and trucks. The Karry-Lode is an all-steel truck, strength with minimum weight is obtained by eliminating the heavy and unnecessary frame. The all-steel platform is the frame of the truck. In the model No. 2 one-point suspension prevents vibration and deflection of supporting members from affecting the motor and battery. In the specifications the details of capacity, weight, speed light and loaded, mileage per charge, motor, battery, tires, controller and safety devices are all given, together with a dimensioned drawing of the models.

Edison Electric Appliance Co., Inc., Hughes Division, Chicago, Ill., has available for distribution a 48-page book entitled "Hughes Electric Range Sales Service Manual." This book is a valuable treatise on the merchandising of electric ranges. From "The secret of successful electric range merchandising" the book gives a series of eight advertisements, each occupying a full page, in which the idea of cooking electrically is the all-important thing. The next nine pages are devoted to "How Form Letters Supplement Your Campaign in Merchandising Electric Ranges," in which form letters are discussed and a number of good letters are shown. Other chapters are: "The Purpose and Value of Hughes Pamphlets, Folders and Other Co-operative Literature," "Two Attractive Folders Intended for Special Distribution: They Cover Important Fields," "How to Use Movie Lantern Slides to Advantage in Merchandising Electric Ranges," "Street Car Advertising Is a Useful Part of Your Publicity on the Electric Way of Cooking," "The Window Display Is a Powerful Factor in Merchandising Electric Ranges—Why?" "Two Attractive Displays for Your Windows," "Some Hints on the Store Display—How Best to Utilize Your Space," "Details Covering Your Display of Hughes Electric Ranges, Floor Plans of Exhibit," "A Little About the Value of the Demonstration as an Aid to Increasing Interest," "Tying in Your Other Activities with Your Hughes Range Demonstration," "The Why and Wherefore of Demonstrations," "Salesmanship and Sales Methods," "After the Electric Range Is Sold and Installed." Repairs and service and co-operation furnished by Hughes salesman are then dicussed together with how the Hughes home economist helps and how to order Hughes co-operative material for a logical and complete campaign, and the expense. The booklet is profusely illustrated, the style is most attractive, the type clear and the paper good. This book should be of immense value to every central-station salesman, in fact to anyone concerned with salesmanship and the art of advertising.

Cutler-Hammer Manufacturing Co., Milwaukee, Wis., has prepared four envelope folders on the "C-H Seventy-Fifty" switch for use by dealers who wish to call their customers' attention to the fact that they are selling appliances equipped with this feed-through switch and also installing them on the cords of appliances purchased before this switch was available. Three of the books are standard envelope size (3½ by 6 in.), while the fourth is a miniature of one of the larger, being 1¼ by 3 in. All of the booklets are attractively printed in two colors. The miniature contains 12 pages, while the larger one like it, contains 8. Both are entitled, "Have You One of These?" and emphasize the advantage of buying electrical appliances with the cords equipped with these switches. They follow the national advertising in that they direct the public to the electric appliance dealer. The other two folders are four pages each. One is entitled, "C-H Seventy-Fifty Switch," while the other has for its title, "The Latest Models Have Them." The latter has a reproduction showing the damage resulting from pulling out the terminal connectors of electric irons, toasters, and other appliances and points out to the user that the C-H 70-50 switch is the remedy for these annoyances, since the necessity of removing the connector plug is eliminated, and in addition, safety from fire is provided because the white and black buttons of this switch indicate whether the current is "on" or "off." Large editions of these folders have been printed to supply the requirements of electrical dealers and lighting companies who use them in various ways among their customers and prospective customers.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

Augusta, Me.—Cumberland County Power & Light Co. will extend its transmission lines from the end of its present line near Gray Corner along Poland Spring Road for two miles.

Boston. Mass.—Lighting Superintendent Mohr is advertising for bids for a contract to equip and maintain for one year 1300 mantle gas lamps and 218 mantle naptha lamps in locations where there are no gas mains or electric service.

Bridgeport, Conn. — Considerable electrical equipment will be required in connection with the construction of the proposed new isolation hospital by the City Board of Health, estimated to cost about $175,000.

Bridgeport, Conn.—Nichols Underwear Co., 395 James street, is making rapid progress on the construction of a new two-story plant and power house, about 76x195 ft., and 20x20 ft., respectively, to provide for increased capacity. The structures are estimated to cost $80,000.

New Britain, Conn.—Trumbull Electric Co. has completed arrangements for the erection of a four-story addition to its plant at Plainville, about 50x106 ft., to provide for increased operations. The company will also erect two one-story structures at the works, about 50x100 ft. and 56x100 ft., respectively. Contract has been awarded to Louis A. Miller, 68 Wilcox street, Meriden.

Brunswick, Ga.—The City Suburban Railway Co. will extend its line. Address general manager.

Elberton, Ga.—Aug. 27 an election will be held to decide the question of issuing $15,000 electric light bonds. Address W. A. Nall, mayor.

Cranston, R. I.—United Wire & Supply Co. has awarded a contract to William H. Hamlyn & Son, 35 Greenwich street, Providence, for the erection of a two-story addition to its plant in the Auburn district, about 40x250 ft. The structure is estimated to cost about $100,000.

Woonsocket, R. I.—Plans have been filed by the French Worsted Co., Hamlet avenue, for the erection of an addition to the boiler plant at its works, about 40x50 ft. Contract for the structure, which is estimated to cost about $35 000, has been awarded to Wilfred Aubin, 1103 Dimond Hill road.

Binghamton, N. Y.—In connection with the expansion program of the Endicott-Johnson Corp., including the erection of a large addition to double the present capacity of the plant, considerable additional power will be required for operation. Electric energy is furnished by the Binghamton Light, Heat & Power Co.

Brooklyn, N. Y.—Brooklyn Rapid Transit Co., 85 Clinton street, is understood to be considering plans for the erection of a large brick and stone power station at Kent avenue and South Sixth street, to provide for increased operations.

Falconer, N. Y.—Merriam Cabinet Co. plans to remodel the Chautauqua Planing Mills and install electric power units. Total estimated cost, $60,000.

New York, N. Y.—Announcement has been made of the suspension of operations of three New York traction companies, due to inadequate operating revenue. The concerns affected are the Mid-Crosstown Railway Co., operating on 28th and 29th streets; Edward A. Maher, president; the Pelham Park & City Island Railroad Co., and the Third Avenue Bridge Co. Notice has been filed with the Public Service Commission of intention to cease operations, holding that they were operating at a loss.

New York, N. Y.—Bruston Automatic Electric Lighting & Power Co., 101 Park avenue, has filed an involuntary petition in bankruptcy, showing liabilities of $60,000 and assets of about $10,000. Judge A. N. Hand has appointed Roger B. Wood receiver of the company; John P. Hopson is president, and George Wishart, treasurer.

New York, N. Y.—New York Telephone Co., 15 Dey street, has awarded a contract for the erection of a two-story addition to its telephone building at West New Brighton, Staten Island, to provide for increased capacity. Extensive alterations and improvements will also be made in the existing structure. John O'Devlin, 233 Broadway, New York, is the building contractor.

New York, N. Y.—Roechling Electric Steel Co., 173 Lafayette street, has filed notice with the Secretary of State of the dissolution of the corporation.

New York, N. Y.—Rapid progress is being made in connection with the construction of the proposed Fourteenth Street-Eastern District subway, which will extend from Sixth avenue, New York, through Fourteenth street, to a connection with the Brooklyn Rapid Transit elevated system near East New York. Contract for the work was awarded to Booth & Flinn, Ltd., at a cost of about $6,639,000, and it is expected that to complete the work will require about 10 months' time.

New York, N. Y.—Sibley-Pitman Electric Corp., 190 Sixth avenue, manufacturer of electrical specialties, has filed notice with the Secretary of State of an increase in its capital from $150,000 to $250,000, to provide for general business expansion.

Oswego, N. Y.—City intends to construct and equip a complete electric lighting system at cost of $90,000. Major Bensel, consulting engineer.

Cape May, N. J.—Board of Public Utility Commissioners has approved the sale of the Vulcan Electric Light, Heat & Power Co. to the Cape May Court House Light & Water Co. for a consideration of $35,072, and for certain proposed bond issues by the petitioner. It was held that the Vulcan company was in default on the payment of interest on outstanding bonds, aggregating $32,000.

Garwood, N. J.—The plant of the C. & C. Electric & Manufacturing Co., Center street, manufacturer of electrical specialties, etc., has been offered for sale by William Tuttle, Jr., receiver. The works are located on the main line of the Central Railroad of New Jersey on property comprising about five acres, the various structures having a total of 60,000 sq. ft. of floor space, and are fully equipped for all departments of operation.

Lakewood, N. J. — Lakewood & Coast Electric Co. has been granted permission by the Board of Public Utility Commissioners to place into effect a new schedule of rates to yield additional revenue needed to meet the increased cost of operation.

Newark, N. J.—Announcement has been made that satisfactory agreements have been entered into between the striking tool makers and machinist specialists and officials of the Splitdorf Electric Co., 98 Warren street. The strike involved about 300 persons, and it is understood that various demands of the strikers have been granted.

Newark, N. J.—Public Service Corp. has been authorized by the Board of Public Utility Commissioners to place into operation, effective Sept. 14, a new zone plan for the collection of fares. It is proposed to charge three cents for travel within the first zone mile, with a charge of two cents for each additional zone mile or part thereof. The new rates will replace the flat seven-cent fare now in force on the company's system.

Perth Amboy, N. J.—Board of Aldermen is considering plans for the purchase of the plant of the Perth Amboy Gas Light Co., to be used for municipal service. It is understood that estimates of valuation of the property are now being taken, and it is expected that this work will be completed around the end of September.

South Amboy, N. J.—City Council is understood to be arranging plans

for extensions in the electric street-lighting system, and the installation of new lighting units of increased capacity. Electric service is furnished by the Monmouth Lighting Co.

Trenton, N. J.—Plans are under consideration by the City Commission for improvements in the municipal lighting system.

Allentown, Pa.—Allentown-Bethlehem Gas Co. has filed a new tariff of rates for its Allentown district, Bethlehem, Catasauqua, and Hellertown districts, effective Sept. 1. The schedule covers a minimum monthly charge of 25 cents per meter of 3 or 5 lights; 5, 10, 20 or 30-light meters, 50 cents per meter per month; 45, 60, or 80-light meters, 75 cents per meter per month; and 100-light capacity meters and over, $1 per month, all the above being service charges.

Allentown, Pa.—Board of Managers of Allentown hospital has recently completed alterations and improvements in the boiler plant at the institution, to facilitate operations.

Allentown, Pa.—S. & W. Electrical Co. has recently inaugurated operations in its new establishment at 613 Turner street. It is proposed to engage in general electrical repair and construction. William S. Solliday, formerly connected with the Lehigh Electric Co., and Edgar Weaver, also associated with the same company, are partners in the new organization.

Catasauqua, Pa.—Work has recently been completed by the Borough Council on the installation of new lighting units of increased capacity for the municipal street-lighting system. About 400 units were installed.

Harrisburg, Pa.—It is interesting to note the number of increases recently filed with the Public Service Commission, covering the issuance of stock or bonds. Among the companies notifying the Commission are: Renovo Edison Light, Heat & Power Co., Renovo, common stock, $18,500; Eastern Pennsylvania Railways Co., Pottsville, bonds, $198,000; Allentown-Bethlehem Gas Co., Allentown, bonds, $210,000; Philadelphia Rapid Transit Co., Philadelphia, equipment trust certificates, $88,000, and bonds, $174,000.

McMurray, Pa.—McMurray Telephone Co., operating in Washington county, has filed a new schedule of rates for service, effective Sept. 1. It is proposed to increase the existing rates 20%, with an extra charge for extension and installation.

Mauch Chunk, Pa.—Mauch Chunk & Lehighton Transit Co. has filed notice of the issuance of preferred stock for $50,000, common stock for $150,000, and bonds for $130,000, to provide for proposed business expansion.

Nanticoke, Pa.—Dunlap Silk Co., Hazleton, is having plans prepared for the construction of a new brick and concrete boiler plant at its local silk mills. The structure will be two stories in height, about 90x100 ft. Emil Buehler is local manager.

Philadelphia, Pa.—Announcement has been made by the Philadelphia Rapid Transit Co. of an increase in the wages of its conductors and motormen of seven cents per hour. The increase will affect about 6000 persons.

Philadelphia, Pa.—Contract has been awarded to Ketcham & McQuade, Philadelphia, for the construction of a boiler plant at the Globe Theatre, 59th and Market streets, to facilitate operations.

Philadelphia, Pa.—County Gas & Electric Co. has filed notice with the Public Service Commission of a bond issue for $1,800,000, to provide for general business expansion.

Philadelphia, Pa.—Plans are being prepared by the Department of Public Works for the construction of a one-story brick, stone and steel pumping station at the municipal waterworks plant at Lardners Point, to provide for increased capacity. It is understood that the station will be electrically-operated.

Pittsburgh, Pa.—Equitable Gas Co., the Allegheny Heating Co., and the Monongahela Natural Gas Co. are co-operating in a campaign for the economical use of gas throughout the local territory served, including both retail and wholesale consumers. The companies urge the installation of modern methods for gas burning and other features of operation to bring about greatest efficiency.

Pittsburgh, Pa.—Notice has been filed with the Public Service Commission by the Beaver County Light Co. for the issuance of bonds for $24,000, to provide for general business expansion.

DATES AHEAD.

Michigan Section, N. E. L. A. Annual convention, Ottawa Beach, Mich., Aug 26-28. Headquarters, Hotel Ottawa. Secretary-treasurer, Herbert Silvester, Monroe, Mich.

Pennsylvania Electric Association. Annual convention, Bedford Springs, Pa., Sept 3-6. Secretary, H. M. Stine, 211 Locust street, Harrisburg.

Washington State Association of Electrical Contractors and Dealers. Annual convention, Seattle, Sept. 11. Secretary, Forrest E. Smith, 205 Boston Block, Seattle.

Southeastern Section, N. E. L. A. Annual convention, Asheville, N. C., Sept. 17-19. Secretary-treasurer, T. W. Peters, Columbus, Ga.

New England Section, N. E. L. A. Annual convention, New London, Conn., Sept. 22-24. Headquarters, Hotel Griswold. Secretary, Miss O. A. Bursiel, Boston, Mass.

Association of Iron and Steel Electrical Engineers. Annual convention, St. Louis, Mo., Sept. 22-26. Secretary, John F. Kelly, Empire building, Pittsburgh, Pa.

American Electrochemical Society. Fall meeting, Chicago, Sept. 23-26. Headquarters, Congress Hotel. Secretary, Prof. Joseph W. Richards, Lehigh University, Bethlehem, Pa.

International Association of Municipal Electricians. Annual convention, Chicago, Sept. 23-26. Headquarters, Auditorium Hotel. Secretary, Clarence R. George, Houston, Tex.

National Association of Electrical Inspectors. Annual meeting, Springfield, Mass., Oct. 13 and 14. Secretary, W. L. Smith, Concord, Mass.

Illuminating Engineering Society. Annual convention, Chicago, Ill., Oct. 20-23. General secretary, Clarence L. Law, 29 West 39th street, New York City.

Pittsburgh, Pa.—Westinghouse Electric & Manufacturing Co. has recently commenced the construction of a large building in Braddock avenue, East Pittsburgh, to be used as a restaurant for employes. The new structure will be three stories in height, and will be connected with the works by an overhead bridge. It is estimated to cost about $250,000.

Sayre, Pa.—Sayre Electric Co. has recently been awarded a contract for furnishing additional electric power for the operation of the Sayre Brass Foundry, managed by the Cayuta Mfg. Co. A total of 100 hp. is required.

Titusville, Pa.—Titusville Light & Power Co. has recently placed into effect increased rates for service.

Baltimore, Md.—Board of Awards has awarded a contract to George R. Bullen, Baltimore, for the installation of a modern heating plant at Public School No. 63, Gough and Wolfe streets.

Wheeling, W. Va.—Fire, Aug. 5, damaged the engine plant at the local branch of Wilson & Co., with total loss estimated at $10,000. It is understood that immediate repairs will be made.

Gaffney, S. C.—City will establish white way lighting system. Superintendent of Light and Water plants.

Belleview, Fla.—Belleview Utilities Co., recently organized, is arranging for the construction of a local plant, estimated to cost $10,000. It is proposed also to construct a transmission system covering seven miles for initial operations. The company recently filed articles of incorporation with a capital of $25,000. James Conway, Harvard, Ill., is engineer.

Miami, Fla.—Miami Electric Light & Power Co. is planning for the reconstruction of its local power plant, with extensive alterations and improvements, to facilitate operations. It is understood that the work is estimated to cost in excess of $150,000.

Sarasota, Fla.—City has completed arrangements for the construction of a power plant for municipal service. The structure is estimated to cost, with machinery installation, about $42,000. The Southern Construction Co., St. Petersburg, is the contractor.

NORTH CENTRAL STATES.

Cleveland, O.—Drew Electric Mfg. Co. contemplates erecting a plant, 2 stories, 80x204 ft., to cost $35,000. D. W. Morrow, Garfield building, is architect.

Hamilton, O.—The council has appropriated $15,000 additional for extension of electric plant. The director of public service was authorized to contract for the labor and material necessary for the extension of the transmission lines.

Marion, O.—The C. D. & M. Electric Co. will install 7 additional lights.

Toledo, O.—Swartz Electric Co. is preparing plans for a factory addition that will practically double the floor space.

Anderson, Ind.—Earl P. Creager, works manager of the plant of the Remy electric division of the General

Motors Corp. here, has announced that the laboratories and sales department of the Remy plant, which have been at Detroit for about five years, will be returned to Anderson within a few days. The laboratories will be in the five-story building that has just been completed at the Remy plant and which also includes the general offices of the company. The additional employes will make a total of about 3800 at the Remy plant. With these departments will come the skilled employes connected with the laboratories and sales department, including C. E. Wilson, who recently was made manager of the sales department, and Dr. M. W. Franklin, in charge of the research department.

Auburn, Ind.—A plan is under way here to organize a stock company with capital of $100,000 for the purpose of erecting 35 or 40 houses, costing from $2000 to $2500 each. Address W. H. Schaab, president, Auburn Commercial Club.

Connersville, Ind.—Ansted Engineering Co. will erect factory building 100 ft. wide and 400 ft. long. The Lexington Motor Co., to which the Ansted Engineering Co. is largely accessory, will build a stockroom and expand its heating system. Work on the foundation of the engineering company's building has just been begun. Work on the other buildings will begin about Sept. 1.

Connersville, Ind. — The Teetor-Hartley Motor Corp., owned principally by Connersville capital, but now situated in Hagerstown, Ind., has purchased ten acres near its Connersville factory area, and will begin the erection of a steel and concrete building 100 ft. wide and 1500 ft. long.

Fort Wayne, Ind.—Officials of the Fort Wayne branch of the General Electric Co. say that the constant increase in business has made the demand for help large and that the company is daily adding to the already large number of employes. With a very few exceptions every line of work carried on by the General Electric Co. is demanding more laborers, both skilled and unskilled. In case there is any slack in any department the men are transferred to departments needing them. R. F. Smith, in charge of the electrical testing and drafting courses, states that the company is still receiving applications for these courses, which are three years long.

Indianapolis, Ind.—The J. G. White Engineering Co., a Connecticut corporation, has withdrawn from business in Indiana.

Mishawaka, Ind.—Grange Elevator Co. will erect $30,000 warehouse. The company has recently been organized with capital of $50,000. M. H. Huston is the president.

Paoli, Ind.—The Johnson Ice Cream Co., Bloomington, Ind., will erect $30,000 plant here.

Roachdale, Ind.—Roachdale Electric Co. has increased its capital stock from $50,000 to $100,000.

South Bend, Ind.—The Northern Indiana Gas & Electric Co. has been authorized by the Indiana Public Service Commission to issue $1,067,000 of 10-year notes for the purpose of improving its properties, these improvements to be made in South Bend, Fort Wayne, Lafayette, Logansport, Michigan City, Hammond and Peru.

Warsaw, Ind.—Winona Assembly management plans erection of a $100,000 auditorium.

Elgin, Ill.—Owing to a strike on the lines of the Aurora, Elgin & Chicago Railroad Co., which has tied up the entire light and power service in Elgin and adjacent towns, the management of the Sherman hospital has decided to install a generator. Mrs. Mary S. Pease has been named chairman of a committee to purchase the generator and equipment.

Freeport, Ill. — Electric lighting rates of the Northern Illinois Utilities Co., affecting this city and Dixon, have been increased by the Illinois Public Utilities Commission, one-half of the war emergency being allowed. The new rates add one and one-half cents to the rates in effect a year ago when war conditions made an increase imperative. Marengo, Harvard and Hampshire are also among the towns served by the company.

Medora, Ill.—An election will be held to decide the question of issuing $12,000 light and power bonds. Address city clerk.

Oswego, Ill.—Consulting Engineer John A. Buesel will prepare specifications for lighting plant equipment to cost $70,000.

Springfield, Ill.—Illinois is taking the lead in a movement to have its county highways lined with electric lights. A plan to have lights strung all the way along the Lincoln Trail, which bisects the state from Terre Haute, Ind., to East St. Louis, and on down to Cairo, is to be lighted if the plans of the promoters are carried out. It is planned to extend lights each way from cities which have plants and it is estimated that farmers will use enough current to pay the expenses. Lighted country highways will offer a novelty to motoring tourists. Illinois is spending $60,000,000 on permanent roads and the proposition to light them is gaining strength.

Lansing, Mich.—Voters have approved issuance of bonds for public improvements amounting to $1,321,000. Bond issues approved are: Municipal light and water plants, $650,000; isolation hospital, $100,000; addition to cemetery, $38,000.

Three Rivers, Mich.—Eddy Paper Co. will erect an electric power plant in connection with the construction of a 1-story paper mill. The entire project is estimated to cost in excess of $1,000,000.

St. James, Minn.—An issue of $20,000 lighting plant improvement bonds authorized by City Council.

Atkins, Ia.—The town of Atkins has decided to have a system of electric lights. At present it has not been decided whether a system be put in at Atkins or whether connections would be made with the line of Iowa Railway & Light Co.

Story City, Ia.—David G. Feshut Co. awarded contract for electric light system and power house at $36,000.

Coats, Kans.—A petition is being circulated asking the mayor and councilmen of the city to call an election to vote bonds for an electric light plant and system.

Ellsworth, Kans.—The installation of a white way is being seriously contemplated.

Ft. Scott, Kans.—All of the properties of the Ft. Scott Gas & Electric Co., including the electric plant, the gas plant, the defunct street railway, was sold at sheriff's sale July 31 to satisfy a first mortgage of $35,000, etc.

Hanover, Kans.—Engineers Black & Veatch, 507 Inter-State building, Kansas City, Mo., have prepared plans for improving electric system.

Hanover, Kans.—A power dam is to be built on Little Blue river here, to cost $150,000. A flour mill will probably be built and the city electric light and waterworks will also use the power besides furnishing power to outside towns.

Harper, Kans.—Plans are being made for a White Way in the business part of the city.

Hazelton, Kans.—Election to vote bonds for an electric lighting system carried.

Hudson, Kans. — City is having plans prepared by W. B. Rollins & Co., engineers, 209 Railway Exchange building, Kansas City, Mo., for the construction of a transmission line for electric plant. Estimated cost, $15,000.

Manhattan, Kans.—The Kaw Valley Transmission Co., of St. George, the Riverside Light & Power Co., of Abilene, the Central Kansas Power Co., of Abilene, the Marshall County Power & Light Co., and the Rocky Ford Milling & Power Co., will soon be reorganized into one company known as The United Light & Power Co.

Manhattan, Kans. — Rocky Ford Milling & Power Co. is having plans prepared for a 2-story building and will install a 7000-hp. steam engine and 3000-kw. and 2000-kw. turbines. Total estimated cost, $500,000.

Pittsburg, Kans. — Appropriation has been made by the Bell Telephone Co., at Pittsburgh, for rebuilding and remodeling the plant and installing new equipment. Work will begin in November.

Scranton, Kans.—Election will be held in the near future to vote $4000 in bonds to provide funds for the extension of the electric light system.

SOUTH CENTRAL STATES.

Hazard, Ky.—Kentucky & West Virginia Power Co. will enlarge plant by taking over three large electric power plants.

Centreville, Tenn.—$15,000 electric light bonds have been voted. Address mayor.

Chattanooga, Tenn. — Cumberland Telephone & Telegraph Co. has recently made announcement that following the return of the telephone properties by the Government to their corporate ownership, plans have been perfected for extensive improvements and additions to increase the present capacity. Extensions will be made in

existing transmission systems, and other enlarged facilities will be provided for, the entire work being estimated to cost in excess of $2,000,000.

Beggs, Okla.—Beggs Power & Ice Co. is understood to be considering plans for the construction of a local electric-light plant. The structure will cost about $75,000.

Comanche, Okla.—Town Council having plans prepared for alterations and improvements in the municipal electric light plant, estimated to cost about $10,000. A. L. White is town clerk.

Eufaula, Okla.—$25,000 bond issue for electric lights and waterworks carried recently. Bids will be advertised soon.

Frederick, Okla.—The city has voted $40,000 electric light bonds. Address mayor.

Oklahoma City, Okla.—The Attorney General has approved a bond issue of $110,000 for electric lights in Newkirk.

Oklahoma City, Okla.—Oklahoma Gas & Electric Co. will take a long term lease on a three-story and basement building, 50 by 140 feet, to be erected on First street, just east of Broadway. The offices now occupied by the company have grown inadequate.

Oklahoma City, Okla.—Election to vote $350,000 in bonds for water main extension was defeated.

Oklahoma City, Okla.—Oklahoma Gas & Electric Co. will erect at once an electric sub-station at 23rd and Ollie avenue. The station will be connected with a high voltage line and will serve northwest residence section.

Perry, Okla.—A bond issue of $260,000 is being contemplated for the purpose of entirely rebuilding and equipping the electric light and water system, also for the construction of a dam. Water mains will be extended and a White Way is considered.

Perry, Okla.—$260,000 in bonds have been voted for rebuilding and enlarging electric light plant and water system.

Perry, Okla.—Plans are under consideration by the city for the issuance of bonds for $260,000 to cover the cost of enlarging and rebuilding the municipal electric-light plant, water and wire systems, etc.

Tishomingo, Okla.—Bids will be advertised about Sept. 1 for electric plant, distribution system and ice plant. F. L. Yarger, city clerk. Johnson & Benham, Firestone building, Kansas City, Mo., engineers.

Tonkawa, Okla.—Preliminary plans are in progress for the extension of the waterworks system and electric plant to cost $117,000. Election to vote the bond issue will be held in the near future. R. R. Redfield, city clerk.

New Orleans, La.—Bids will be received Aug. 30 for furnishing and installing mechanical and electrical equipment including fuel oil pumps, a sludge pump, a deep well pump, fuel oil heaters, a steel flue, superheaters, soot-blowers, plumbing and plumbing fixtures, piping, switchboard, motor-driven exciter, transformers, electric fixtures, wiring and an electric traveling crane and for installing a turbine driven exciter, one 300 and one 320-hp. boilers, two feed-water heaters, and a V notch meter in the power plant at the Naval Station. Address C. W. Parks, Chief of Bureau.

Independence, Mo.—A recommendation that $50,000 bonds be issued for the purpose of building an addition to the power house of the electric plant and for installing a new unit current for the production of current was made to the city council. Address mayor, Christian Ott.

Palmyra, Mo.—Election to vote $10,000 in bonds for the improvement of the present electric light and water plant carried. H. M. Howard, city clerk.

St. Joseph, Mo.—Plans have been completed by the St. Joseph Railway, Light, Heat & Power Co. for extensive improvements and alterations in its plant, to provide for increased capacity. The work includes the installation of a quantity of new equipment, to comprise 12,500 kw. turbine, equipped with surface condensers and auxiliary switchboard equipment, boiler feed pumps and other apparatus, and is estimated to cost in the neighborhood of $1,000,000.

St. Louis, Mo.—St. Louis Mfg. Co. has recently completed plans and awarded a contract to the A. H. Haeseler Building & Construction Co., Wainwright building, for the erection of a power plant for factory operation, about 95x150 ft. The structure is estimated to cost, with equipment installation, $125,000.

Austin, Tex.—The Southwestern Telegraph & Telephone Co. recently purchased a site for a telephone exchange building.

Breckenridge, Tex.—J. E. Lewis, of Dallas, has purchased the local light plant and is making plans for a reconstruction of the old plant and the installation of new machinery. The new company has been granted a 50-year franchise by the city council.

Bryan, Tex.—Election will be held Aug. 26th to vote $75,000 in bonds for the purchase and improvement of the Bryan power plant.

Bryan, Tex.—The Bryan & Central Texas Interurban Railway Co. will transform its motive power from electric to steam equipment. The line runs from Bryan down the valley of the Brazos river 22 miles.

Cisco, Tex.—The Southwestern Telegraph & Telephone Co. has completed a survey of the city for installation of a standard common battery telephone system.

Dallas, Tex.—Notice has been filed with the Secretary of State by the Dallas Power & Light Co. of an increase in its capitalization from $1,000,000 to $2,500,000, to provide for general business expansion.

Dallas, Tex.—S. B. Brooks, of Greenville, has purchased at sheriff's sale the physical holdings and franchise of the Eastern Texas Traction Co. Construction of this interurban electric railway, to run between Dallas and Greenville, about 50 miles, was in progress at the time the great war caused a suspension of the work in 1914. It is planned by Mr. Brooks to reorganize the company and complete the line.

Dallas, Tex.—The Dallas Power & Light Co. has increased its capital from $1,000,000 to $2,500,000.

Dallas, Tex.—The Texas Power & Light Co. of Dallas will build a power transmission line from Dublin to De Leon and Gorman. The company plans also to extend its power lines to other parts of Central West Texas where extensive oil development operations are in progress.

Fort Worth, Tex.—It is stated by H. E. Robinson of Fort Worth, president of the Fort Worth & Western Electric Railway Co., that two routes for the proposed interurban railway, between Fort Worth and Mineral Wells, are under consideration, and as soon as it is decided which will be used the construction will be started. Part of the construction material has been ordered. The line will be about 65 miles long.

Hearne, Tex.—The capacity of the Hearne city light and water plant is to be increased 100%.

Houston, Tex.—According to Ed Kenedy, of Houston, promoter of the Houston, Richmond & Western Traction Co., the construction of the company's proposed interurban electric railway, that is to run between Houston and San Antonio, with a branch from Yoakum to Victoria, will be started as soon as materials can be shipped. The main line will be about 225 miles long and the branch about 30 miles.

Houston, Tex.—Nearly $500,000 will be spent by the Houston Light & Power Co. in extending its lines down the north side of the ship channel. A greater part of the money will be spent for dynamos and other machinery.

Luling, Tex.—The question of issuing $75,000 water and light bonds will be submitted to vote. Address mayor.

Orange, Tex.—The Orange Ice, Light & Water Co. has increased its capital from $60,000 to $100,000.

San Angelo, Tex.—City has decided to build its own water, light and power plant; $500,000 has been appropriated.

Sugarland, Tex.—The Sugarland industries will install an electric power plant.

WESTERN STATES.

Libby, Mont.—The Lukens-Hazel Mining Co. will expend $240,000 for a 200-ton concentrator and power plant. A pipe line will be installed from Granite Creek which will develop 600 hp.

Grand Junction, Colo.—Movement has been started at Collbran for installation of hydroelectric plant to supply power and light to practically every section of Plateau Valley.

Boise, Ida.—Mackay Light & Power Co. has been granted permission by the Public Utilities Commission to extend its transmission lines through the Lost Valley section to Arco, to provide increased operating facilities.

Personal

Charles McKay Joins L. V. Estes, Inc.—E. N. Lake Organizes — W. S. Wyche Returns to Arkansas Valley Co.

J. FRANK HARPER, of Centerville, Md., has been appointed a member of the Maryland Public Service Commission to succeed Albert Towers, recently resigned.

J. F. OWENS, vice-president and general manager of the Oklahoma Gas & Electric Co., was recently elected second vice-president of the Oklahoma City Chamber of Commerce.

O. A. ROFELTY, manager of the Sioux Falls, (S. D.) Division, of the Northern States Power Co., was recently elected president of the South Dakota Electric Power Association.

HERMAN G. HARDY, formerly connected with the Old Hickory Powder Plant at Jacksonville, Tenn., is now chief mechanical and electrical engineer of the Arizona Copper Co., Ltd., Clifton, Ariz.

N. S. BRADEN, former sales manager, has just recently been elected vice-president of the Canadian Westinghouse Co., Ltd., of Hamilton, Ontario. H. M. Bostwick, assistant sales manager, has been appointed sales manager, to fill the vacancy created by Mr. Braden's promotion.

EDWARD N. LAKE, formerly manager and treasurer of the Krehbiel Co., and previously resident engineer of Stone & Webster, has organized the Lake Engineering Co., of which he has become president. The company will engage in general engineering work and will be located at 139 N. Clark street, Chicago.

E. T. SAWYER has recently accepted a position as a representative of the railway sales department of the U. S. Light & Heat Corp., Niagara Falls, N. Y. Mr. Sawyer will specialize on car lighting equipment and electric arc welders and will make his headquarters at 30 East Forty-second street, New York.

LAWRENCE B. CHAPMAN, of the technical staff of the Electric Boat Co., New London, Conn., has been appointed associate professor in the new course of ship construction and marine transportation instituted last year at Lehigh University. Professor Chapman is a graduate of the Massachusetts Institute of Technology.

JOSEPH HARRIS, for 30 years a dominant figure in automatic telephony and president of the Automatic Telephone Co. of Chicago, Ill., has resigned from this position to become chairman of its Board of Directors. He will be succeeded by A. F. Adams as president of the company.

Several other changes have also been made in the organization of this company. H. L. Gary has been elected vice-president and treasurer; H. A. Harris, vice president and general manager, and W. F. Benoist succeeds H. A. Harris as its sales manager.

CHARLES W. MCKAY, formerly connected with the engineering firm of McMeen & Miller, Chicago, and subsequently with the Cooley & Marvin Co., of Boston, has recently taken charge of the Appraisal Division of L. V. Estes Incorporated of Chicago. Mr. McKay is the author of the series of articles now running in the ELECTRICAL REVIEW on the general subject of Electric Utility Rates and Valuations. Mr. McKay's removal to Chicago will be of especial interest to the readers of the ELECTRICAL REVIEW in that it places him in closer touch with the electric utility field and will enable him to give more attention to the features of the series

Charles W. McKay.

which involve the answering of questions. Mr. McKay has been engaged in engineering and appraisal work since his graduation from Sibley College of Mechanical Engineering, Cornell University, in 1906. In July, 1906, he entered the employ of the New York & New Jersey Telephone Co. (now the New York Telephone Co.), and after serving a brief apprenticeship in the maintenance department was assigned to the plant-engineering department. In 1909 he was appointed engineer for the North Brooklyn district, having charge of the preparation of plans and estimates for all outside construction work within the district. In 1910, at the time the New York Telephone Co. absorbed all of the up-state Bell companies, Mr. McKay was assigned to special work and spent the greater part of the following year in inspecting a number of the larger of the company's newly-acquired properties, and in 1911 was appointed engineer for the Borough of Queens. During the year 1912-13, Mr. McKay was associated with Henry Floy in the capacity of assistant engineer, and while holding this position he was identified with several important appraisal cases. In the summer of 1913 he became engineer to the McCall & Clark Co., efficiency experts of New York, and in October, 1913, became affiliated with McMeen & Miller, of Chicago. While with this well known enginering firm, Mr. McKay spent the major portion of his time on problems involving the appraisement of public utility properties. He later engaged in valuation work for the Central Union Telephone Co., and continued in this capacity until his appointment with the Cooley & Marvin Co. He is a prolific writer on appraisal subjects and has contributed extensively to the technical press. The Appraisal Division of L. V. Estes Incorporated, of which Mr. McKay will have full charge, will specialize in problems involving the appraisement of electric utility and industrial properties. L. V. Estes Incorporated are known to many of the readers of the ELECTRICAL REVIEW through their extensive work for the electric industries.

KARL G. ROEBLING, president of the John A. Roebling's Sons Co., Trenton, N. J., has been elected a director of the American Ship & Commerce Corp., New York City.

W. L. MCCLOY, JR., Pittsburgh, has been appointed general manager of the Philadelphia Co., Pittsburgh, to succeed Caroll Miller, resigned. Mr. McCloy has been connected with the Philadelphia Co. for more than 30 years, having risen to the position of general superintendent before the final promotion to general manager.

CAPT. W. S. WYCHE of the Second Engineers, U. S. A., has returned from overseas and rejoined the Arkansas Valley Railway Light & Power Co., Victor, Colo. Captain Wyche was twice honored for bravery in action. Once he was decorated with the Croix de Guerre with palm conferred by Marshal Petain, and once he received a special enlarged citation from General Pershing.

COL. H. M. BYLLESBY is serving on the Special Technical Jury appointed to investigate and report on the cause of the recent dirigible balloon disaster of Chicago. Colonel Byllesby is also treasurer of the Illinois State Committee for the National Celebration of Constitution Day Sept. 17. This movement is in connection with efforts which are being made to counteract Bolshevism and other non-American influences.

Obituary.

EMIL H. SCHMIDT, Rochester, N. Y., superintendent of the municipal Police Telegraph & Fire Bureau, died suddenly on August 6, following an attack of heart failure, at his home, 189 Canterbury road. Mr. Schmidt was in his fiftieth year.

Financial News

Business Conditions.

Judging by current trade and the demand for money and labor the country is in a most prosperous state. The situation is remarkable for mid-summer, when some slackening of activity, and of pressure for goods and money is usual. It is extraordinary when we recall the uncertainty as to prices and trade prospects which existed a few months ago, but illustrates how great a factor is confidence. The change is due to a re-establishment of confidence so far as the immediate future is concerned. Everybody is satisfied that a great trade is ahead for the remainder of this year, and they are now busy preparing for that. Beyond that the situation is not so clear, but the people who must buy goods now for next spring are generally feeling that they must go ahead upon the present basis and get ready for it, taking the chances. They realize that sooner or later they will be caught by a declining market, but unless they want to go out of business they must be ready to do business, making the best of vicissitudes.

At present there is a cry from all parts of the country for goods. Prices on goods ready for delivery are a secondary consideration. Practically full employment and high wages in the industrial centers is an obvious factor but underlying that is the confidence and prosperity which pervades the agricultural districts, and back of it all are the enormous purchases which other countries are making here, as shown by the astounding figures for exports. It is well to know the source to which we are indebted for this trade, because it is not a source that can be relied upon to play so large a part permanently, and there is much in the home situation that is disquieting.

U. S. Rubber Company to Increase Capital.

At a meeting of the Board of Directors of the United States Rubber Co. held in New York City on Aug. 7, an increase in capitalization was unanimously authorized. The action of the board was taken in compliance with the recommendation of Samuel P. Colt, chairman of the board, as a means of providing the capital necessary to finance the increasing volume of business that is in evidence. The directors announced their intention of placing the common stock on an 8% dividend basis, beginning next October, and stated that, if earnings warrant the action, a substantial extra dividend will be paid to stockholders in the spring of 1920.

Stockholders of record on Aug. 8 will meet on Sept. 7 to vote on the proposal for the increase of stock. If the stock issue is authorized, shares of the new common will be offered to present stockholders for subscription at par, or $100 per share, on the basis of one new share for one old share now held. After recommending the increase to provide a total capitalization of $100,000,000 preferred and $200,000,000 stock on the retirement of the present second preferred, the chairman said:

"The volume of business transacted by the company for five years in round numbers was $83,000,000 in 1914, $92,000,000 in 1915, $125,000,000 in 1916, $176,000,000 in 1917 and $215,000,000 in 1918. During that period the capital stock of the company remained substantially the same.

"The indebtedness of the company was funded in 1917 into long term 5% bonds. The surplus earnings for the years 1917 and 1918 were equivalent each year to about 30% on the common stock and the earnings for the first half of 1919 have been substantially the same as in the first half of 1918.

"Your company is engaged in a business capable, on conservative lines, of large expansion, the tire business both of passenger vehicles and trucks being a notable example of this. For the last two years your company has been unable to meet the demand for its tires and, notwithstanding its capacity has already been substantially increased, further construction has been authorized which will require in the neighborhood of $15,000,000 for its completion and which will double the present capacity of the company for producing tires. The amount of present outstanding common stock, compared with the property of the company, is relatively very small.

"In view of these conditions your chairman would recommend, upon the certificate of organization being amended as proposed, that $36,000,000 of additional common stock be issued and offered to our common stockholders at par in order to provide ample capital to meet the enlarged business of the company without the application of so large a proportion of earnings for that purpose as has been done the last few years.

"Your chairman is also of the opinion that the company is now amply justified in placing its common stock upon an 8% dividend basis and he would, therefore, recommend that dividends at the rate of 8% per annum be paid upon the common stock of the company beginning in October next, and further that an extra distribution either in stock or in cash, such as may be warranted under all conditions, be made early in 1920 to common stockholders."

July Charters for Banks.

The office of the Comptroller of Currency announces that during the month of July 20 charters for new national banks were granted and 54 applications for increases of capital of existing national banks were approved.

California Company to Issue Notes.

The Sierra & San Francisco Power Co. has asked the Railroad Commission for authority to issue five notes of the face value of $30,000 each to the United Railways Investment Co., the notes to be secured by the pledging of bonds of the face value of $200,000. The United Railways Investment Co. has offered $140,000 for the notes, and the Sierra company seeks authority to make the issue on the ground that it has been unable to dispose of the $1,000,000 of bonds authorized by the commission in May, 1918. The petition shows that the indebtedness of the company, other than the bonded indebtedness, is for current expenses and advances from consumers amounting to $164,544.03, and that the proceeds of the note issue are to be used for improvements at the Stanislaus power plant and other betterments.

Erie Lighting Stock Issue.

Paine, Webber & Co., Chicago, is offering 7% cumulative preferred stock of the Erie Lighting Co. at 92½ and accrued dividend to yield 7.57%. The Erie Lighting Co. serves a population of over 120,000 in Erie, Pa., and adjacent territory, with electricity for lighting and power purposes and does a steam heating business in Erie. The company has an installed capacity of 32,000 hp. contained in two stations which have been erected within the past six years, one of which, with an ultimate capacity of 65,000 hp. has just been completed. This utility is making gross earnings of over $1,000,000 and is showing more than 20% earned on the preferred stock after payment of all expenses.

Cumberland Valley Company Elects Officers.

At the recent annual meeting of the directors of Cumberland Valley Telephone Co., held at the offices of the company, 227 Walnut street, Harrisburg, Pa., the following officers were re-elected for the ensuing year: President, William J. Lescure; vice-president, John C. Motter; secretary and treasurer, O. K. Kines; and general manager, Cameron L. Baer.

Illinois Commission Authorizes Note Issues.

The Illinois Public Utilities Commission has authorized the Decatur Railway & Light Co., Decatur, Ill., a subsidiary company of the Illinois Traction System, to issue promissory notes to the amount of $40,698. The Commission has also approved a promissory note issue of the Quincy Railway Co., Quincy, Ill., another subsidiary of the Illinois Traction System, in the amount of $104,919.

Clinton Wright Wire Stock.

Liggett & Drexel and Knauth, Nachod & Kuhne companies have formed a syndicate to purchase and resell 70,000 shares of common, $50 par, of Clinton-Wright Wire Co. The stock is being offered for public subscription at $36 a share.

United Light & Railway Surplus

Surplus earnings of the United Light & Railway Co. and subsidiary companies for the 12 months ended April 30, after payment of dividends at 6% on the first preferred, amounted to $509,658 for 1919, an increase of $15,209 over 1918 period. Reported figures of United Light & Railways Co. for four months to April 30, 1919, showed an increase of $61,276 after preferred dividend.

This improvement in surplus is qual to .89% on the 4% common stock, and compared with a surplus of $128,152 for the four months period, an increase of 47.81% over four months to April 30, 1918.

Statement of earnings of United Light & Railways Co. and subsidiaries for the 12 months period ended April 30 follows:

	1919.	1918.
Gross earning	$9,659,547	$8,232,303
Net after taxes	2,858,574	2,729,802
Balance, app. to Un. Lt. & Rys. Co.	1,955,486	1,836,610
Bal. after int. chgs...	*116,730	1,101,378
Surplus after pfd. div.	509,658	494,449

*Interest on notes and commercial loans increased $132,258 and decreased $29,447 during this period.

Earnings.

WISCONSIN EDISON.

Comparative income account of Wisconsin Edison properties, inter-company dividends and interest eliminated, is as follows:

	1919.	1918.
June gross	$1,338,932	$1,134,760
Net after taxes, etc...	306,608	245,467
Surplus after charges.	113,888	62,858
Six months' gross....	8,526,651	6,827,395
Net after taxes, etc...	1,737,437	1,247,280
Surplus after charges.	567,964	146,971
12 months' gross	16,291,601	13,137,013
Net after taxes, etc...	3,458,511	3,132,293
Surplus after charges.	1,252,757	1,097,485

Income account of Wisconsin Edison Co., controlled by North American Co., is as follows:

	1919.	1918.
June gross	$ 120,139	$ 76,122
Net after taxes	119,182	75,392
Surplus after charges.	74,420	23,104
Six months' gross....	621,107	276,834
Net after taxes	610,769	271,785
Surplus after charges.	320,878	*48,259
12 months' gross	1,541,547	1,334,960
Net after taxes	1,505,422	1,301,601
Surplus after charges.	898,294	678,979

*Deficit.

INTERBOROUGH RAPID TRANSIT.

	1919.	1918.	1917.
May gross	$4,019,001	$3,524,432	$3,511,496
Net after taxes	1,427,059	1,521,970	1,798,857
Total income	1,477,934	1,564,228	1,860,362
Surplus after charges	*432,136	580,523	854,317
11 months' gross	39,294,196	37,208,118	36,608,909
Net after taxes	12,470,321	16,295,094	18,837,690
Total income.	13,012,653	16,786,699	19,335,900
Surplus after charges	*3,039,006	6,794,245	8,469,450

*Includes accruals under contract No. 3 and related certificates amounting to $585,879 for May, 1919, and $6,650,501 for 11 months ended May 31, 1919.

For the Readjustment Period—What?

XLIX.

Our Country First Conference

Agitation of the causes of our national unrest, coupled with indiscriminate charges, makes the frank discussion by all patriotic citizens of the problems and conditions underlying the situation an absolute necessity.

Several distinct groups are endeavoring to create public sentiment by the presentation of exparte views. Congress, to arrive at a just conclusion, needs the facts, as well as the views of all classes of citizenship. A clear and fearless expression of opinion should be formulated and proper committees appointed to present the conclusions reached to congress and others concerned, in order that fair and honest legislation may be enacted, a square deal given to all and the nation freed of the agitators who are trying to overthrow the very foundations of our government.

To obtain a formal expression of opinion, after a full and free discussion, the Illinois Manufacturers' Association has called a conference to be held at the Congress Hotel, Chicago, September 8 and 9, the first meeting to convene on Monday, September 8, 1919, at 10:00 a. m.

The International Power Economy Conference is most cordially invited to be represented at this conference by three delegates. You are also urgently requested to send at once, if possible, the names of your delegates, together with a list of subjects which in your judgment should be considered and discussed by the conference as a whole and which may become the basis of resolutions upon which the Convention may act.

A complete program of the conference will be sent you later.

DORR E. FELT, President,
JOHN M. GLENN, Secretary.

The [above] is copy of a call being mailed to the [leading industrial and labor organizations of] the country. It should have prompt and careful attention from every one.

C. A. TUPPER *President*
INTERNATIONAL TRADE PRESS, INC., CHICAGO

BLACKSTONE VALLEY GAS & ELECTRIC.

	Gross earnings.	Net earnings.	Surplus after charges.
May, 1919	$ 195,864	$ 51,987	$ 27,674
12 mos. ended May 31, 1919	2,530,148	622,388	373,149

EL PASO ELECTRIC CO.

	Gross earnings.	Net earnings.	Surplus after charges.
May, 1919	$ 126,206	$ 34,852	$ 27,344
12 mos. ended May 31, 1919	1,350,625	388,340	304,460

THE CONNECTICUT POWER CO.

	Gross earnings.	Net earnings.	Surplus after charges.
May, 1919	$ 89,854	$ 39,111	$ 20,244
12 mos. ended May 31, 1919	1,143,884	457,113	230,908

SOUTHWESTERN POWER & LIGHT.

The gross and net earnings of the properties controlled by the Southwestern Power & Light Co. for May compare as follows:

	1919.	1918.
Gross earnings	$ 465,152	$ 399,995
Net earnings	159,598	141,895
Twelve months—		
Gross earnings	5,982,160	4,995,510
Net earnings	2,133,527	2,048,985

STANDARD GAS & ELECTRIC CO.

Combined earnings of the utility subsidiaries of Standard Gas & Electric Co. for the month of May, 1919, and the 12 months ended May 31, 1919, compared with corresponding previous periods, are reported as follows:

Month of May—	1919.	1918.
Gross earnings	$2,065,011	$1,712,475
Net earnings	761,418	676,770
Year ended May 31—		
Gross earnings	25,330,873	20,803,854
Net earnings	9,421,792	8,575,369

These earnings do not include those of the recently acquired Shaffer Oil & Refining Co.

ADIRONDACK ELECTRIC POWER.

Gross earnings—	1919.	1918.
May	$ 130,025	$ 128,663
12 months	1,796,708	1,703,279
Net earnings—		
May	60,005	37,295
12 months	475,406	359,756

ALABAMA POWER.

Gross earnings—	1919.	1918.
May	$ 211,173	$ 239,408
12 months	3,232,824	2,414,060
Net earnings—		
May	121,173	150,268
12 months	1,712,518	1,442,735

COLUMBIA GAS & ELECTRIC.

Gross earnings—	1919.	1918.
May	$ 918,256	$ 877,375
5 months	5,928,330	5,314,280
Net earnings—		
May	441,769	442,213
5 months	3,554,166	3,618,347

DETROIT EDISON.

Gross earnings—	1919.	1918.
May	$1,210,340	$1,030,408
5 months	6,651,306	5,681,213
Net earnings—		
May	295,610	231,942
5 months	1,888,101	1,599,233

SOUTHERN CALIFORNIA EDISON.

Gross earnings—	1919.	1918.
May	$ 882,362	$ 772,951
12 months	9,334,303	8,157,903
Net earnings—		
May	550,390	522,052
12 months	5,799,044	5,277,901

Dividends.

H. M. Byllesby & Co. announce that the $450,000 6% gold notes of the Arkansas Valley Railway, Light & Power Co., Pueblo, Colo., which mature July 1, 1919, are payable at the Continental & Commercial Trust & Savings Bank, Chicago.

Upper Hudson Utilities Corp. has filed notice with the Secretary of State of an increase in its capitalization from $889,500 to $897,000, to provide for general business expansion.

The Pierceton Light & Water Co. has petitioned the Indiana Public Service Commission to issue $15,000 of common stock and $20,000 of preferred stock. The company will use the additional capital to buy property and to make additional improvements.

Gas & Electric Securities Corp., 60 Wall street, has filed notice with the Secretary of State of an increase in its capital from $2,000,000 to $3,000,000, to provide for general expansion.

Philadelphia & Suburban Gas & Electric Co. has filed notice with the Public Service Commission of the issuance of bonds for $278,000, to provide for general expansion.

DAYTON POWER & LIGHT CO.

	May, 1919.	May, 1918.	Five months ended May 31, 1919.	Five months ended May 31, 1918.	Twelve months ended May 31, 1919.	Twelve months ended May 31, 1918.
Gross earnings	$214,053	$175,862	$1,211,658	$ 947,722	$2,694,665	$2,055,150
Operating expenses (including depreciation and taxes)	136,330	118,623	758,212	677,318	1,742,845	1,417,668
Net earnings	$ 77,723	$ 57,239	$ 453,446	$ 270,404	$ 951,820	$ 637,462
Non-operating revenue	3,034	3,062	12,665	10,635	35,332	17,344
Total income	$ 80,757	$ 60,301	$ 466,111	$ 281,039	$ 987,152	$ 654,806
Interest on bonds	$ 32,113	$ 32,241	$ 160,767	$ 128,168	$ 386,109	$ 234,014
Other deductions (including other interest and sinking fund).	9,698	11,639	52,400	59,081	139,973	132,021
Total deductions	$ 41,811	$ 43,880	$ 213,167	$ 187,249	$ 526,082	$ 366,035
Net income	$ 38,946	$ 16,421	$ 252,944	$ 93,790	$ 461,070	$ 288,771
Dividends on preferred stock	15,733	14,813	77,570	74,062	183,060	177,750
Surplus	$ 23,213	$ 1,608	$ 175,374	$ 19,727	$ 278,010	$ 111,021
Operating ratio	63.69%	67.45%	62.58%	71.47%	64.68%	68.98%

CITIES SERVICE CO.

	12 mos. ending June 30, 1919.	12 mos. ending June 30, 1918.	Month of June, 1919.	Month of June, 1918.
Gross earnings	$21,566,635.33	$20,907,945.77	$1,601,017.02	$1,808,929.16
Expenses	668,172.53	398,630.73	54,139.49	38,392.84
Net earnings	$20,898,462.80	$20,509,315.04	$1,546,877.53	$1,770,536.32
Interest on debentures	1,199,439.39	13,814.69	167,372.96	5,750.73
Net to stock	$19,699,023.41	$20,495,500.35	$1,379,504.57	$1,764,785.59
Dividends to preferred stock	4,083,203.00	3,951,898.50	351,207.00	336,641.50
Net to common stock and reserves	$15,615,820.41	$16,543,601.85	$1,028,297.57	$1,428,144.09
Debenture fund			$ 729,408.66	
Contingent fund			578,301.54	
Stock surplus			1,607,720.74	
Surplus reserve			6,484,974.65	
Surplus			31,576,638.82	
Total surplus and reserves			$40,977,044.41	

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

Public Utilities.	Div. rate. Per cent.	Bid Aug. 5.	Bid Aug. 12.
Adirondack Electric Power of Glens Falls, common	6	12	12
Adirondack Electric Power of Glens Falls, preferred	6	75	75
American Gas & Electric of New York, common	10+extra	130	125
American Gas & Electric of New York, preferred	6	41	41
American Light & Traction of New York, common	..	228	230
American Light & Traction of New York, preferred	6	97	96
American Power & Light of New York, common	4	62	63
American Power & Light of New York, preferred	6	73	73
American Public Utilities of Grand Rapids, common	..	10	10
American Public Utilities of Grand Rapids, preferred	7	30	30
American Telephone & Telegraph of New York	..	103⅛	102¾
American Water Works & Elec. of New York, common	..	5½	6
American Water Works & Elec. of New York, particip	7	11	10
American Water Works & Elec. of New York, first preferred	..	58	38
Appalachian Power, common	..	4	4
Appalachian Power, preferred	7	23	23
Cities Service of New York, common	+extra	443	436
Cities Service of New York, preferred	6	77½	76¾
Commonwealth Edison of Chicago	8	108⅞	107½
Comm. Power, Railway & Light of Jackson, common	..	26	25
Comm. Power, Railway & Light of Jackson, preferred	6	60	57
Federal Light & Traction of New York, common	..	10	10
Federal Light & Traction of New York, preferred	..	50	46
Illinois Northern Utilities of Dixon	6	70	75
Middle West Utilities of Chicago, common	2+extra	34	30
Middle West Utilities of Chicago, preferred	6	58	53
Northern States Power of Chicago, common	..	67	65
Northern States Power of Chicago, preferred	ex.div.7	91	90
Pacific Gas & Electric of San Francisco, common	..	67	67
Pacific Gas & Electric of San Francisco, preferred	6	88	87½
Public Service of Northern Illinois, Chicago, common	7	89	87
Public Service of Northern Illinois, Chicago, preferred	6	94	94
Republic Railway & Light of Youngstown, common	4	15	15
Republic Railway & Light of Youngstown, preferred	6	52	52
Standard Gas & Electric of Chicago, common	..	35½	29
Standard Gas & Electric of Chicago, preferred	6	45½	44
Tennessee Railway, Light & Power of Chattanooga, common	..	5½	5
Tennessee Railway, Light & Power of Chattanooga, preferred	6	20	19
United Light & Railways of Grand Rapids, common	4	45	45
United Light & Railways of Grand Rapids, preferred	6	72	72
Western Power of San Francisco, common	..	22	22½
Western Union Telegraph of New York	extra	87	85
Industries.			
Electric Storage of Philadelphia, common	4	85	86
General Electric of Schenectady	8	162	162⅞
Westinghouse Electric & Mfg. of Pittsburgh, common	7	52¾	52⅝